# THE MARINE REVIEW

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# Improving the Des Moines Rapids

*A Description of the Keokuk Dam Across the Mississippi River With Its Effects on Navigation*

THE Mississippi river as far as obstructions other than low water are concerned is singularly free from navigation difficulties all the way from St. Paul to New Orleans. In fact there are only two places in this entire stretch requiring locks; one is at Rock Island and the other at the Des Moines rapids, near Keokuk. At Rock Island the lift requirement is approximately 12 ft., and at Keokuk about 22 ft. At the latter point the Mississippi River Power Co. is now constructing an immense dam across the river primarily for the purpose of generating hydro-electric power. The work, however, incidentally includes the construction of a large lock and dry dock and so alters the character of the stream for many miles that its details are of concern to anyone interested in navigation on the Mississippi river.

The rapids at Keokuk were produced by glacial action. The channel of the river at this point is of comparatively recent origin and was originally located some distance to the west. The old channel at some pre-historic time was dammed by the intrusion of a glacier and the river forced to the eastward. The conditions which caused the river to cut a valley 5 to 10 miles wide in the pre-glacial age were absent in the post-glacial age when the present channel constituting the Des Moines rapids was formed. As a result the bluffs and rapids are closer to the present river than at any other point south of St. Paul. This allows a dam at Keokuk with a comparatively small area overflowed by the pool above, thus keeping the cost of flood damage within reasonable limits and makes the proposition financially feasible.

The Des Moines rapids extend for a distance of about 12 miles from Keokuk to Montrose, Ia.; between these points the river bed has a fall of 23 ft. The surface fall is about 16 ft. at high water and 23 ft. at low water, the greater part of this fall being in the lower 8 miles. The river is in a solid limestone formation and its bed is practically smooth so that there are no broken water or surface disturbances during ordinary stages. The stream is nearly a mile

FIG. 1—KEOKUK POWER HOUSE AND DAM WITH LOCK SITE IN FOREGROUND

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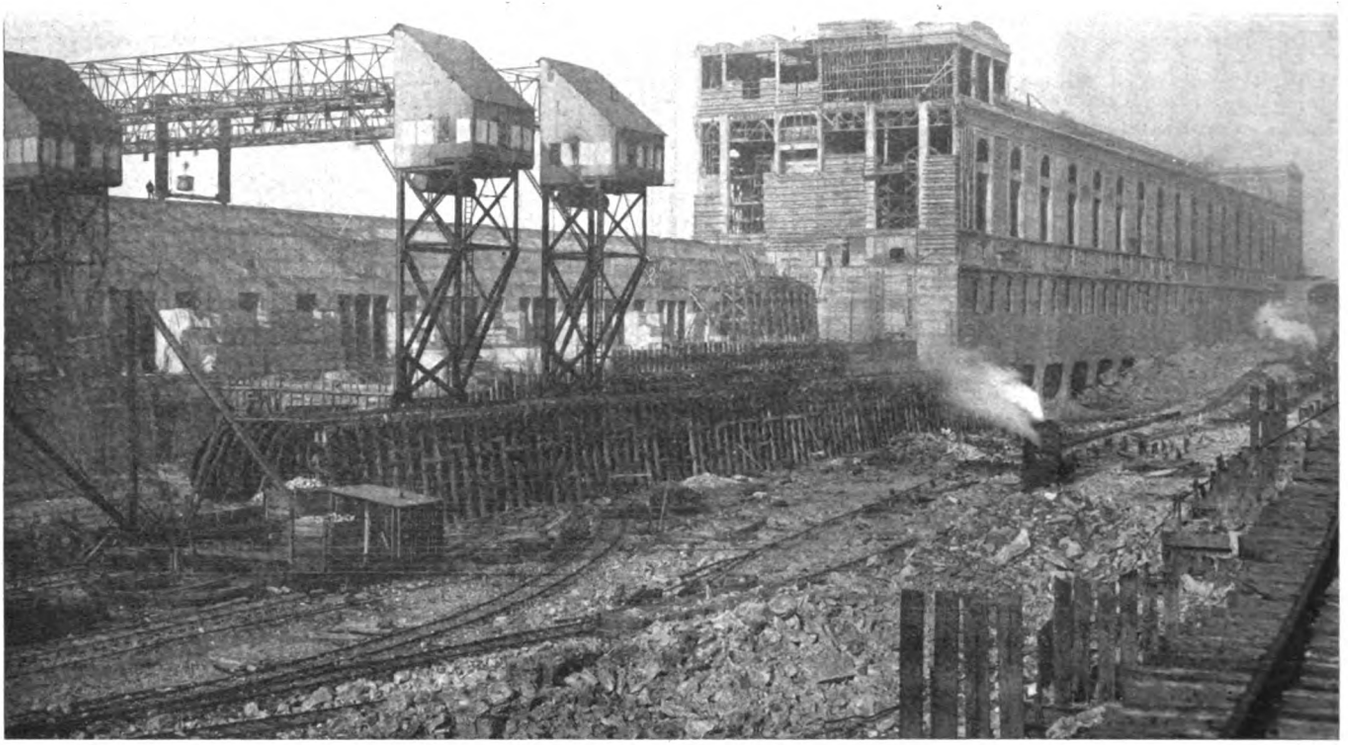

FIG. 2—THE POWER HOUSE UNDER CONSTRUCTION

wide and has a depth of about 7 ft. at mean water. Observations extending over a period of 20 years indicate that the volume of water flowing through the river at this point varies from 20,000 cu. ft. per second at low water to 372,500 cu. ft. at flood stage. The mean water level will be raised about 35 ft. by the dam and the normal working head on the hydraulic machinery will be 32 ft., although this may vary from 20 to 39 ft. from high to low water.

Previous to the civil war there was a large amount of traffic on the Mississippi river and except at high water the boats had to discharge their cargoes at the foot of the Des Moines rapids and be hauled over light by animal power. Commercial demands on congress, however, were finally successful in securing a lock and canal system to pass these rapids which was opened for traffic in 1877. There are three locks with a net width of 80 ft. admitting boats up to 350 ft. in length overall. It requires about two hours for a steamboat to pass the three locks and 12 miles of canal. The lockage is free, but the expense to the government in operating the system has been about $40,000 per year.

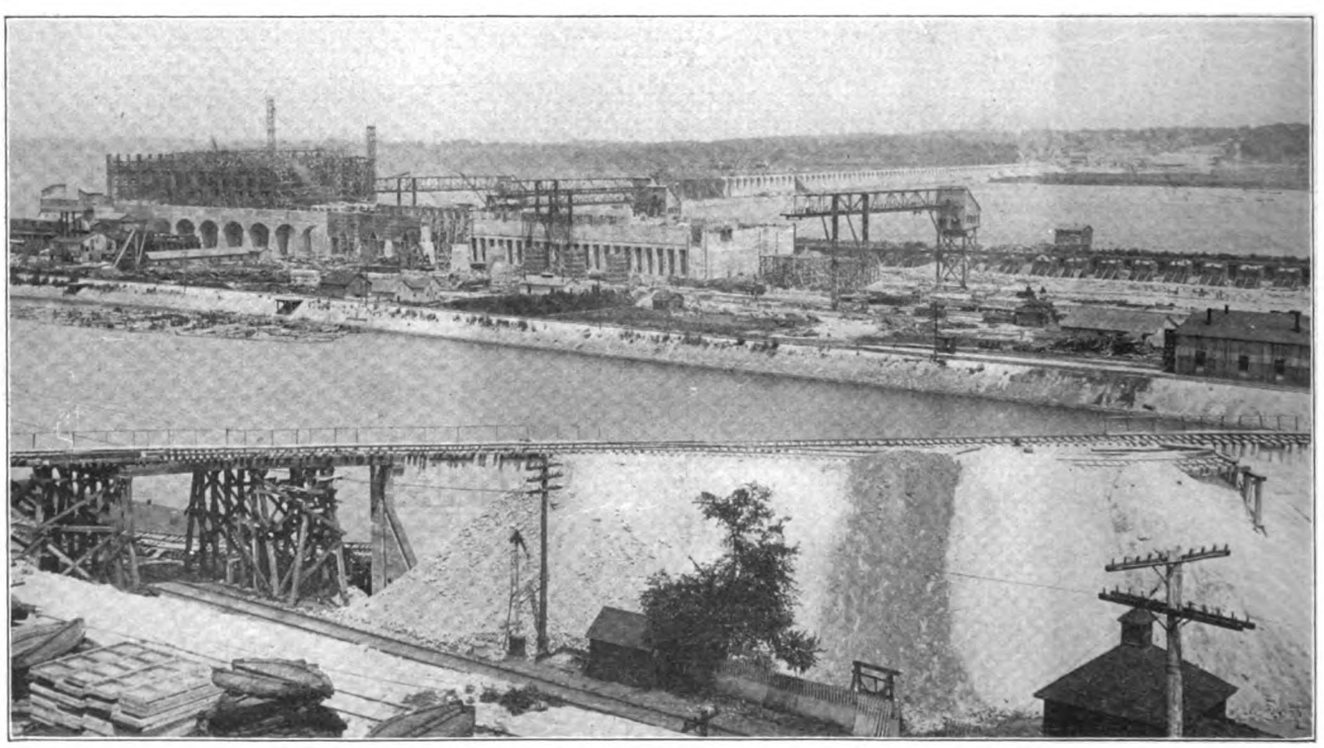

FIG. 3—GENERAL PLAN OF THE KEOKUK PROJECT

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The Mississippi River Power Co.'s new dam is largely the result of the personal effort of Hugh L. Cooper, an eminent hydraulic engineer, but before him the matter had been agitated in public and private channels for two generations. The first real surveys were made in 1848 by Robert E. Lee, subsequently commander of the armies of the confederacy, but at that time a young engineer officer in the service of the United States. He reported that the scheme would not be practicable until the surrounding country was settled up and until engineering science had surmounted the obstacles that then stood in the way of efficiently utilizing the power. But the people could not appreciate the soundness of Lieut. Lee's advice and 60 years was wasted in fruitless attempts to accomplish what has now been realized. All kinds of schemes were projected with all kinds of people behind them. There was Joseph Smith, prophet of Mormonism, murdered before he had time to move far, and there was strong, erratic Zebulon Parker, inventive genius, who lost his fortune in his efforts to construct a wing dam that would resist the ravages of flood and ice. Parker was followed by a man named Gates, whose efforts met equal disaster. The final effort was made by the citizens of Hamilton, Ill., and Keokuk, Ia., when they organized a little water power company in 1899 and raised $2,500 by the sale of stock. The power company formed, they asked the councils of their respective towns to subscribe $7,500 additional and with this $10,000 in hand they secured a franchise to build a dam all the way across the river. This corporation is known as the Keokuk & Hamilton Water Power Co.

*The Appearance of Mr. Cooper*

About 10 years elapsed and Mr. Cooper appeared on the scene. Through his efforts and with the cooperation of the Stone & Webster syndicate, the capital necessary for the present operations of the Mississippi River Power Co. was obtained. It was subscribed for in comparatively small lots, 35 per cent in the United States and 65 per cent in foreign countries—Canada, England, France, Germany and Belgium chiefly. The work is being executed on the authority of the original franchise obtained by the Keokuk & Hamilton Water Power Co., which has been taken over by the Mississippi River Power Co. The money advanced by the cities of Keokuk and Hamilton has been returned to their respective municipal treasuries.

*New Lift Lock*

Before the war department would grant permission for the construction of the dam, it had to be assured that the interests of navigation would be amply protected. Accordingly the power company agreed to construct a new high lift lock to take the place of the three old locks and canal which will be flooded by the back water from the dam. The new lock is of concrete construction, 110 ft. wide, with a clear length of 400 ft., and a lift of 40 ft. The width, it will be noted, is the same as that of the locks in the Panama canal. Adjacent to the lock a 115 x 463-ft. dry dock, together with a repair plant, is being constructed. The lock, dry dock and appurtenances are being built by the Mississippi River Power Co. at its own expense, and will be deeded over to the United States upon completion.

The entire development at Keokuk, the general features of which are illustrated in Fig. 1, and also in the plan, Fig. 3, comprises the following three important features: A spillway, bridge type dam extending 4,694 ft. from the east (Illinois) side of the river; a power house, 1,718 ft. long parallel with the river and extending down-stream from the end of the dam on the Iowa side; and a short dam with navigation lock connecting the lower end of the power house with the Iowa shore. The short dam forms the forebay for the power house and also includes a dry dock adjacent to the lock.

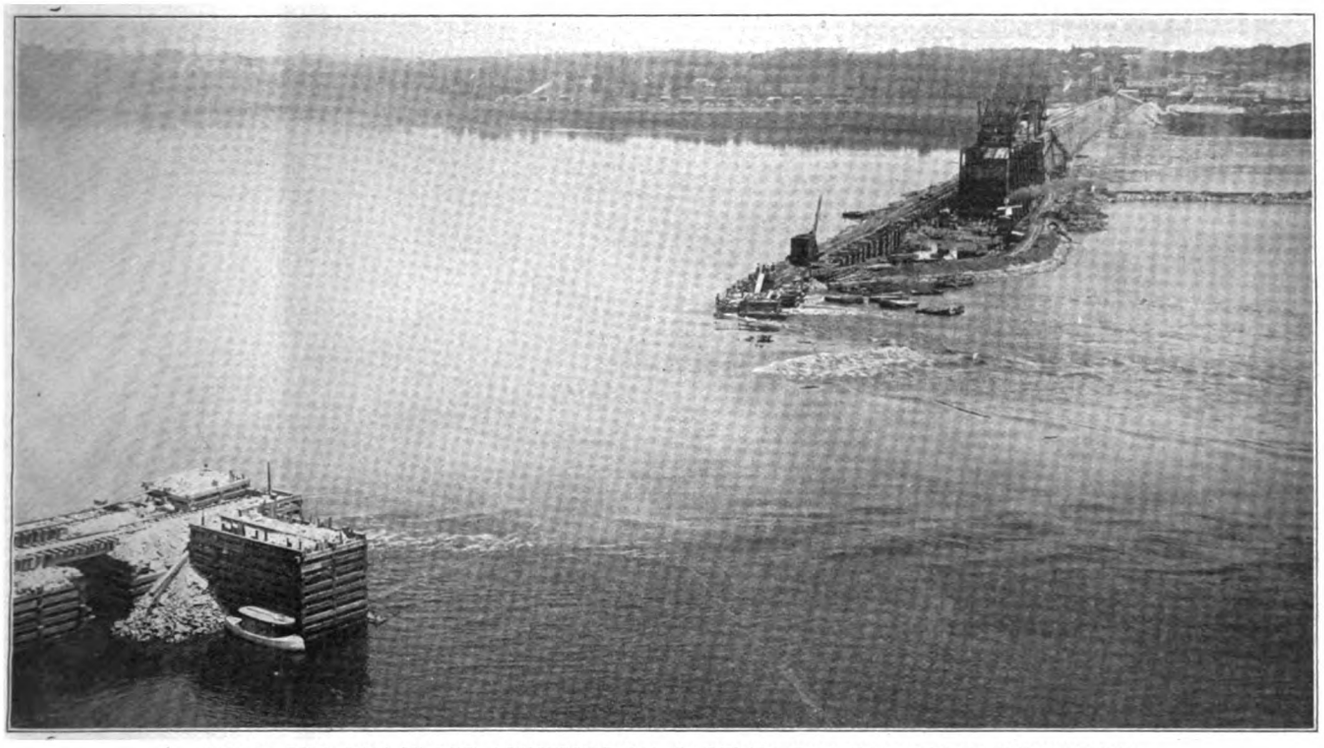

FIG. 4—THE DAM UNDER CONSTRUCTION, SHOWING THE TEMPORARY COFFER DAM

The main dam consists of a series of 119 arched spans with piers, 6 ft. thick, and spans of 30 ft., inside. The spillway sections are, therefore, each 30 ft. long and 32 ft. high. The structure is 29 ft. wide on top, sufficient for a double-track standard gage railway, and 43 ft. at the bottom. The

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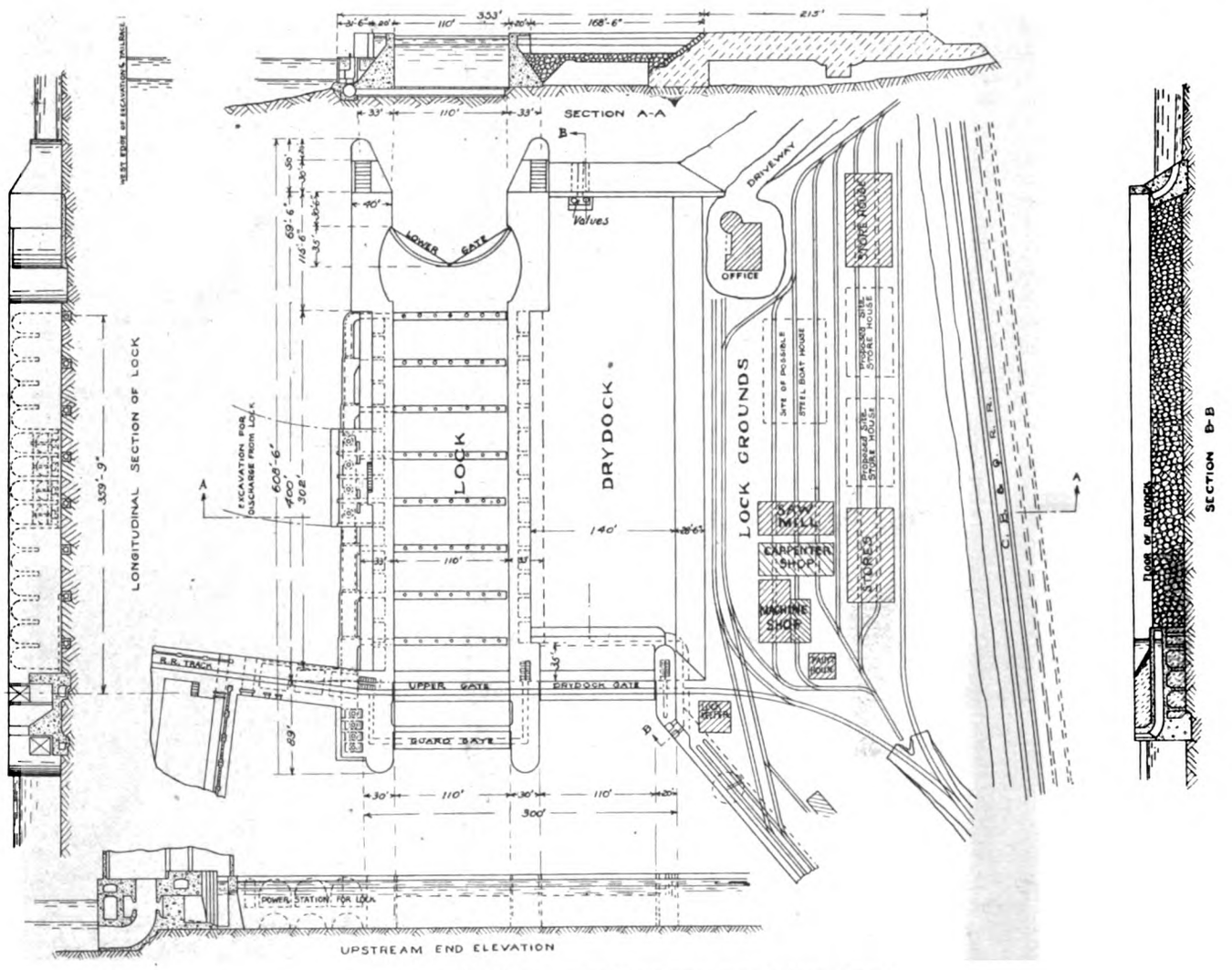


FIG. 5—PLAN AND SECTION OF DRY DOCK AND LOCK

power house is a concrete monolith and is designed to contain 30 vertical, special Francis type turbo-generator units of 10,000 normal horsepower. Only 15 units are being installed at the present time; the remainder will be added as the demand for power increases. Eight of the turbines were furnished by the I. P. Morris Co., Philadelphia, and seven by the Wellman-Seaver-Morgan Co., Cleveland. The generators, which are designed for a normal output of 7,500 kilowatts each, at 11,000 volts, three phase, were all built by the General Electric Co.

The dam forms a pool 60 miles long above Keokuk and will flood about 3,000 acres of land, about 65 per cent of which is on the Iowa side and 35 per cent on the Illinois side. Practically all of this land was purchased from the owners by private negotiation, over 800 persons being involved. In only about half a dozen cases was it necessary to institute condemnation proceedings.

In addition to the features mentioned, the power company is constructing a concrete ice fender, 2,325 ft. long, to protect the forebay in winter and is building a seawall, 1,110 ft. in length and from 45 to 73 ft. high, to protect the tracks of the Chicago, Burlington & Quincy railroad along the Iowa shore, from high water. The dam will create a quiet lake with a minimum depth of 8 ft., extending 60 miles up the river above Keokuk. Twenty-five miles of macadam highway are being constructed around the lower end of the lake by the power company. Since the plant is being built in a navigable stream, all the plans must be approved by the chief of engineers of the war department. One reason for the unusual massiveness of everything connected with the dam and power plant is found in the low head available, which necessitates the employment of large units to obtain the requisite power.

All the work is handled by direct administration, none of it having been let to contractors. About 2,500 men are employed. When the plant is completed and delivering power to consumers it will represent a total cost of approximately $22,000,000, on which the fixed charges, including depreciation, interest and taxes, will be close to $2,860,000 a year.

A plan and elevation of the lock and dry dock with their appurtenances is given in Fig. 5, while Fig. 6 shows a general view of the lock chamber looking up-stream from the lower gates.

As mentioned above, the lock has a net width of 110 ft. and a minimum length inside of 400 ft. Its length outside is 608 ft. 6 in., and the overall width is 176 ft. Ordinary steel miter gates are installed at the lower end, but the upper gates are of the buoyancy type with many interesting details to make them fool-proof.

The lock is located adjoining the south of the lower end of the power house between the latter and the Keokuk shore line. The first work in its construction was excavating the river bed and for this purpose an immense cofferdam, which also includes a power house, was constructed. It covers about 35 acres and is composed of 16 x 24-foot timber cribs which extend about 15 feet above the river

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bed. Each crib contains about 22,000 ft. of lumber and is held in place by loose rock filling. The cribs are made watertight by sheet piling faced with clay. When the river bed was unwatered, the excavation on the lock site was done by blasting and steam shovels, the rock being crushed and used for concrete.

In the bottom of the lock is a gridiron of culverts, as indicated in Fig. 5, the main being under the bottom of the east wall running lengthwise of the lock, while the laterals cross the lock floor at intervals of 45 ft. The laterals are 6 ft. in diameter and the nipples connecting them with the floor of the lock are 3 ft. in diameter. The main ranges in diameter from 6 ft. at the lower end to 13 ft. at the upper end. The culverts are cast of concrete around a steel lining. There is a system of small temporary cofferdams which permit any culvert to be emptied and entered for inspection or repairs. The culverts are so designed that they will fill the lock in about 10 minutes.

At the same time the culverts and floor of the lock were being built, work was progressing on the construction of the walls. The latter are reinforced concrete monoliths, the east one being continuous with the power house and the west one with the dry dock. Each wall is 52.35 ft. high and 33 ft. wide at the base. At the top are inset arches giving a wider causeway along the top. The solid top of the east wall is 8 ft. wide and that of the west wall 20 ft.; the west wall is thicker because it is also the wall of the adjoining dry dock.

### *The Gates*

The gates and other machinery around the lock and dry dock will be operated by compressed air created by two water turbines set in the dam just east of the lock. Either turbine has sufficient capacity for the total operating requirements of the lock and dry dock.

The lower gates, Figs. 9 and 10, are of the usual miter type and were fabricated by the Chicago Bridge & Iron Co., Chicago. They are each 50 ft. high and 115 ft. long. The pivots, which are hardened steel working in bronze bushings, are hemispherical 18 in. in diameter. The gates when closed form an arc of a circle 66 ft. 4¾ in. in diameter with its convex side up-stream to present a maximum resistance against the pressure of the water in the lock. The framing of the lower gates is clearly indicated in Fig. 10. Provision has been made against the sag pull, approximately 374,000 lb., by embedding steel members in the concrete walls opposite the gate hinges. The weight of the gates is also partly neutralized by 12 x 32-ft. buoyancy chambers inside each leaf.

Considerable interest is attached to the construction of the upper gates which are of the buoyancy type and float into position over their seats. There are two gates at the upper end of the lock, one being a guard normally inactive and the other the regular working gate. They are made to interchange with the dry dock gate so that any one of the three may be used at any position, thus preventing delays in operation of the lock through damage to the gates. A section of the buoyancy gates is shown in Fig. 7 and an elevation in Fig. 8.

Each gate is simply a rectangular steel chamber approximately 18 ft. square and 110 ft. long. The buoyancy chamber, which may be filled with or emptied of water, occupies the lower half of the interior of the gate, as indicated in Fig. 7. When in its proper position, the gate moves up and down in vertical slots of steel of a special design, which includes latches to fasten the gate in the closed position.

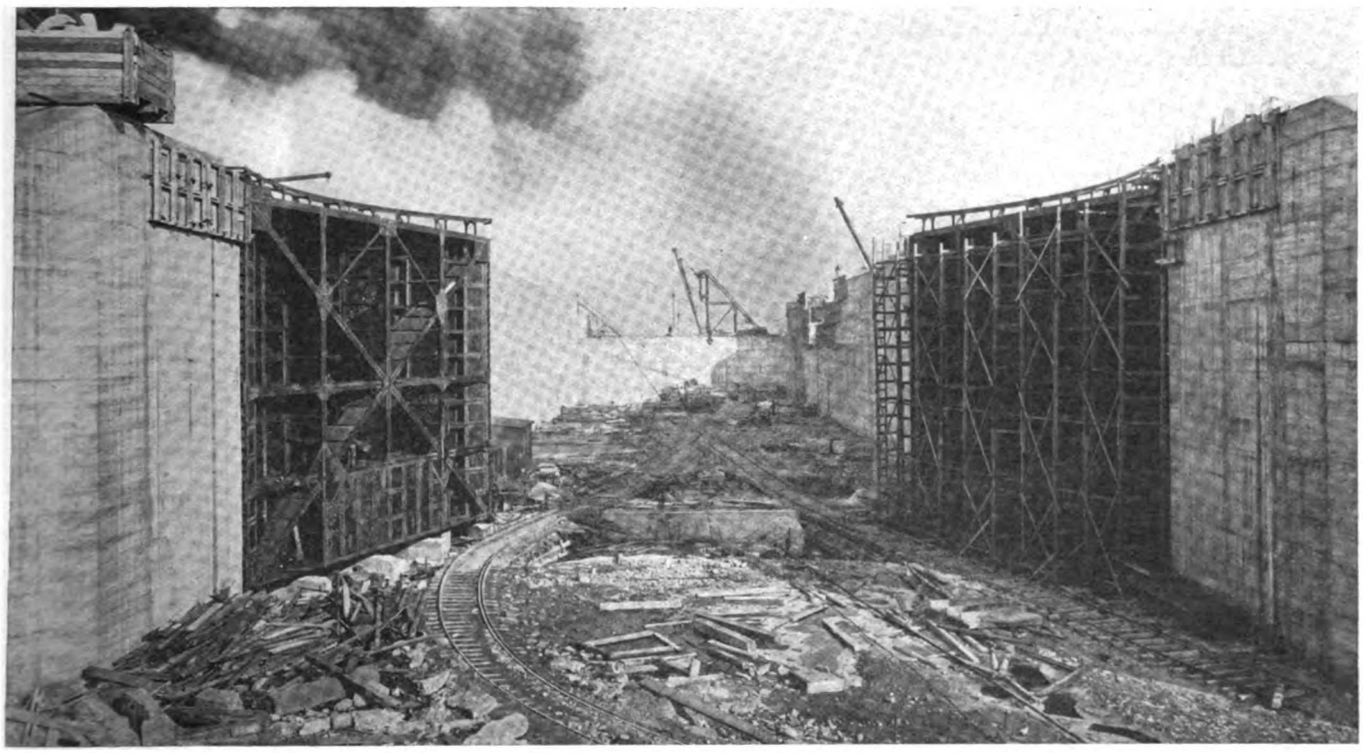

FIG. 6—LOOKING UP-STREAM THROUGH LOCK

### *Operation of the Locks*

When a boat wishes to enter a lock, the valves are opened which admit water into the buoyancy chamber in the gate and permit the air therein to escape. The gate sinks vertically, as does a filling boat, until its top is a little below the sill beside which it rests. The guard gate in Fig. 7 is shown occupying this position. When the boat has entered the lock, the water in the buoyancy chamber is forced out by the compressed air and

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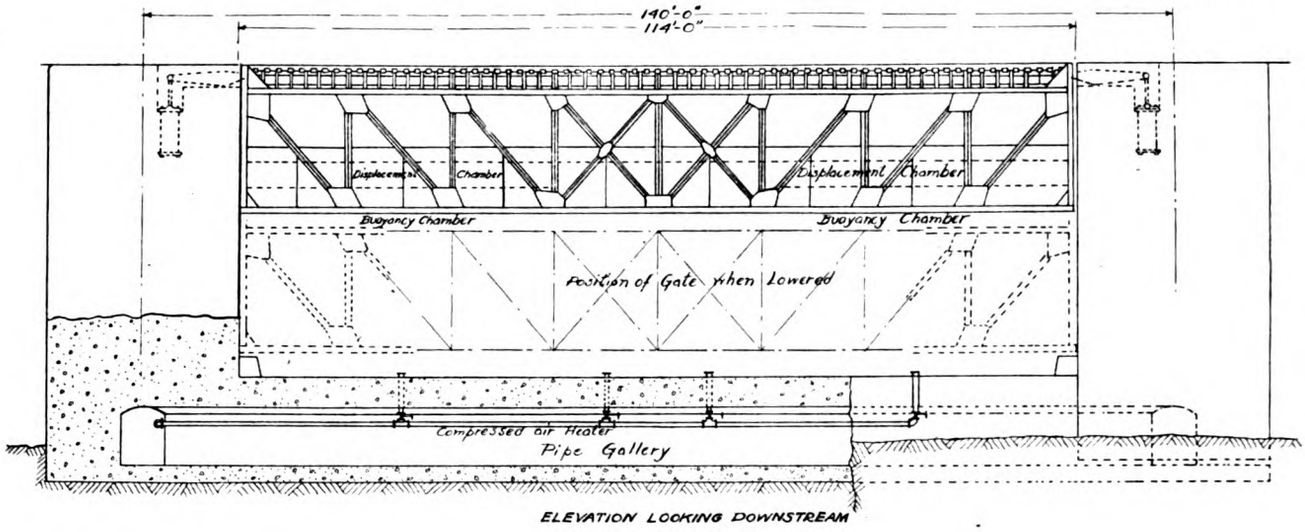


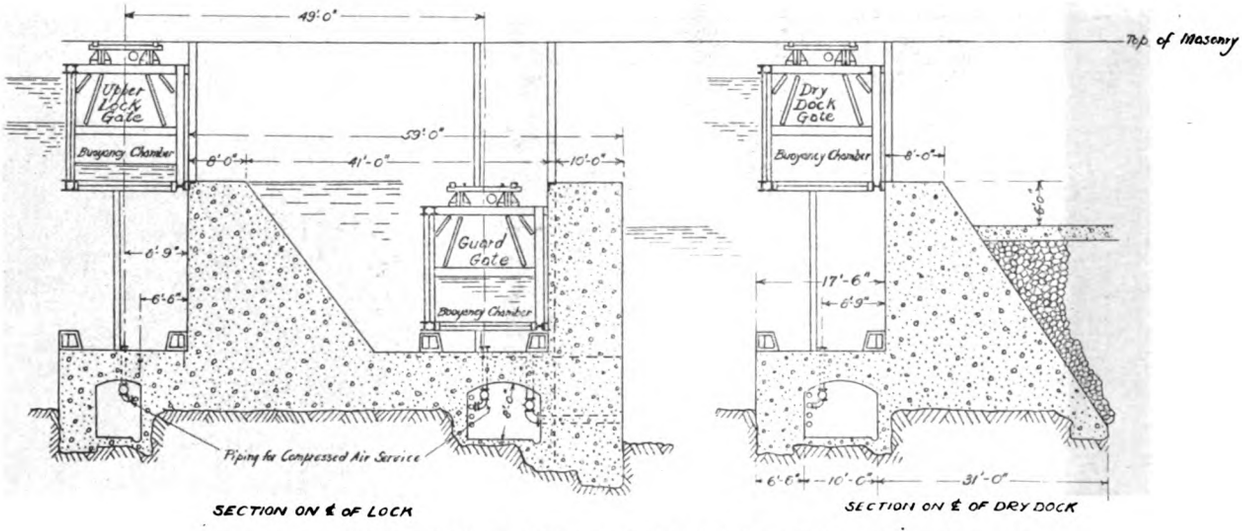


FIGS. 7 AND 8—BUOYANCY GATES FOR LOCK AND DRY DOCK

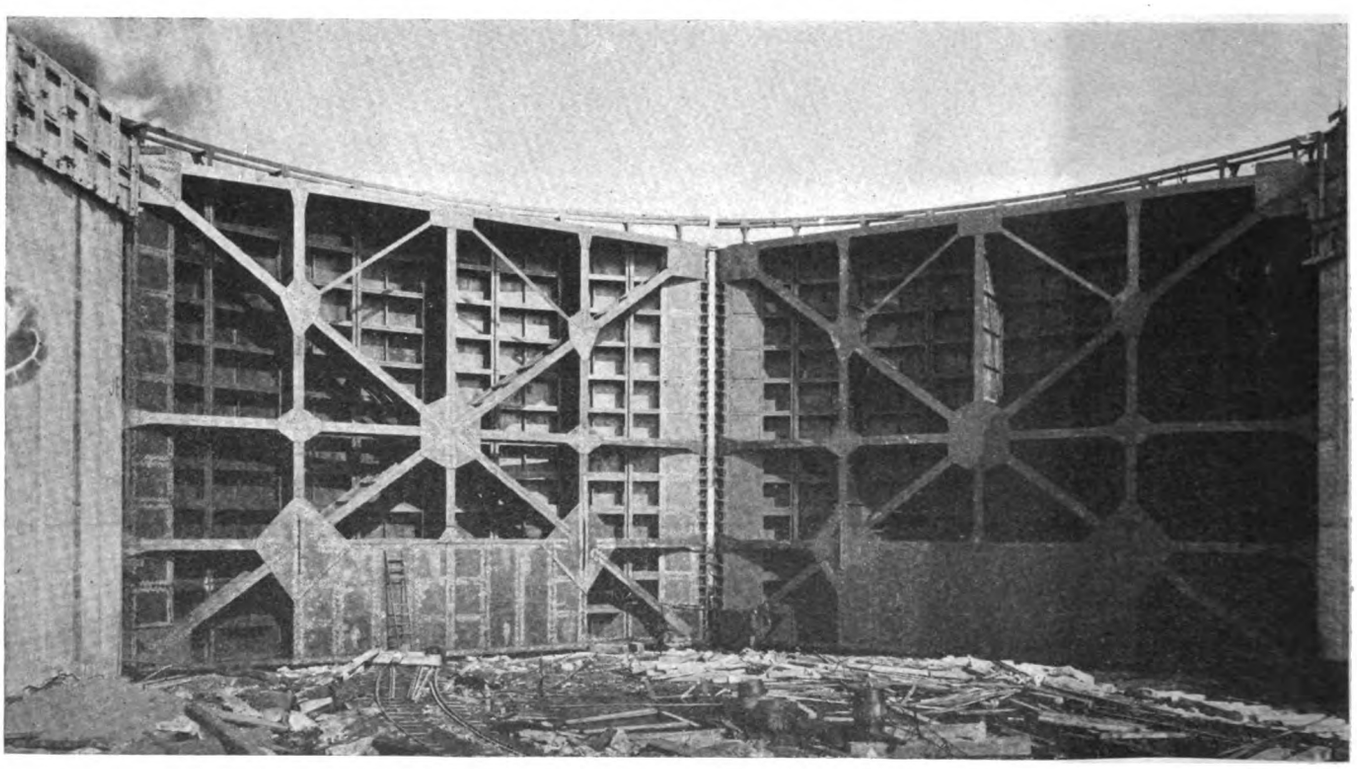

FIG. 10—STEEL FRAMED LOWER LOCK GATES

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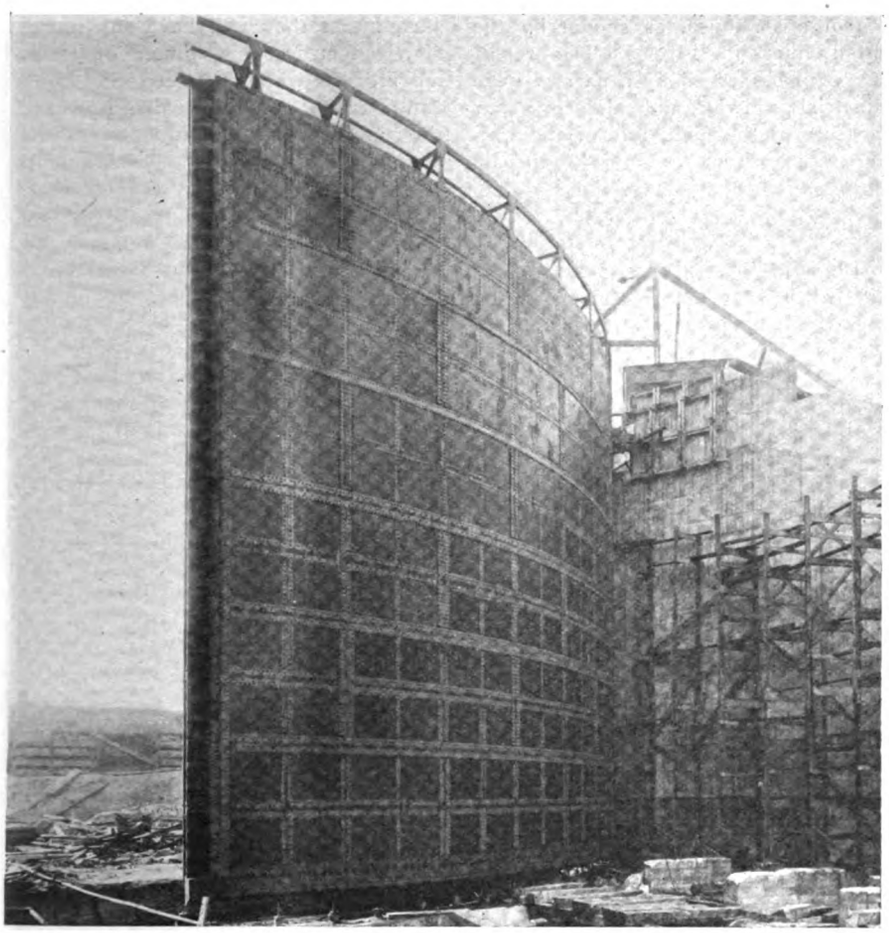

FIG. 9—UP-STREAM SIDE OF LOWER GATE

the gate rises to its original position, closing the lock, as indicated at the extreme left in Fig. 7. The control valves are interlocked so that mistakes cannot be made by the man operating the gate. On top of the gate will be a standard railroad track over which freight will be hauled to the power house. It is interesting to note that the new gates in the Kaiser Wilhelm canal in connection with a lock 160 ft. wide, with a lift of 57 ft., will be patterned after the buoyancy gates at the Keokuk lock.

The time required for a boat to go through this new lock will be about 10 minutes, also for 60 miles up the river above the dam there will be deep water permitting full speed and the numerous crossings of the channel will of course be eliminated. It requires over one hour to go through the three locks now in use and two hours for a boat to pass through the canal under slow speed. Steamboat officers who have been making the run for many years estimate that the time between Keokuk and Montrose, a distance of 12 miles, will be shortened fully two hours. The new lock will be opened for service early in the summer of 1913.

### *The Dry Dock*

The dry dock, which is shown in plan in Fig. 5, will be built alongside the new lock between the latter and the Iowa shore, covering a large area where the lower lock of the old canal is now located, together with the headquarters building of the United States engineer officer in charge of this part of the river. Considerable filling has been necessary to construct the dry dock, the floor of which rests on piles. The dock is of the graving

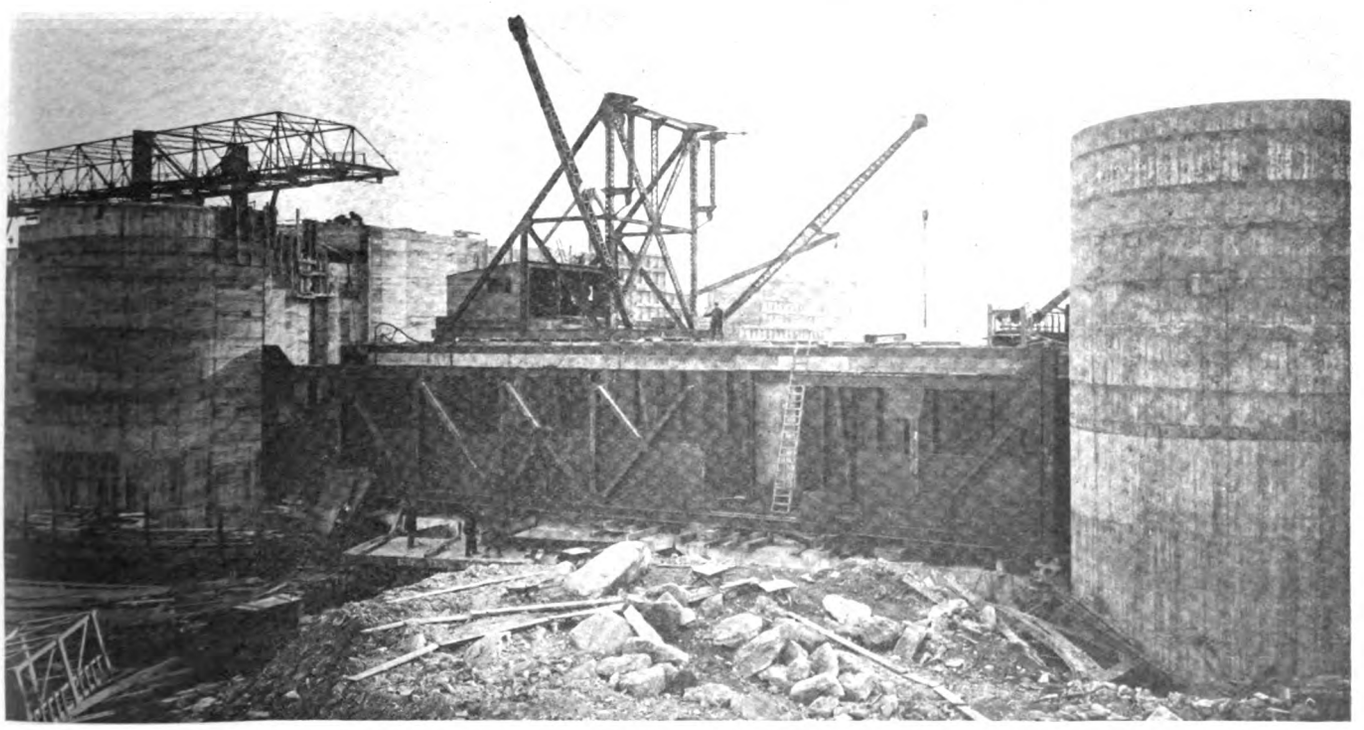

FIG. 11—BUOYANCY TYPE GUARD GATE AT UPPER END OF LOCK

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type, 150 ft. wide and 463 ft. long inside, and is closed at the upper end by a buoyancy gate similar to the upper lock gates. On the filled ground west of the dry dock will be located a complete repair plant, including a machine shop, 30 x 60 ft., with blacksmith shop annex, a paint house, 25 ft. square, a carpenter shop, 32 x 72 ft., and two store houses, 45 x 85 ft. In addition to this, two other store houses are proposed together with a steel boat house, as shown by the dotted lines in Fig. 5. The repair plant will be served by a narrow gage industrial railway and also by spur tracks from the main line of the Chicago, Burlington & Quincy railroad, which skirts the lock site.

*Influence on Freight Movement*

Although these improvements will greatly facilitate navigation on the upper Mississippi river, it is not expected that they will have any immediate effect on the volume of traffic moving by water between St. Louis and Davenport. Eventually, however, the increasing population, resulting from the industrial developments which will accompany the development of the great water power at Keokuk, will create a demand for transportation which can be effectively supplied by boats operating on the river.

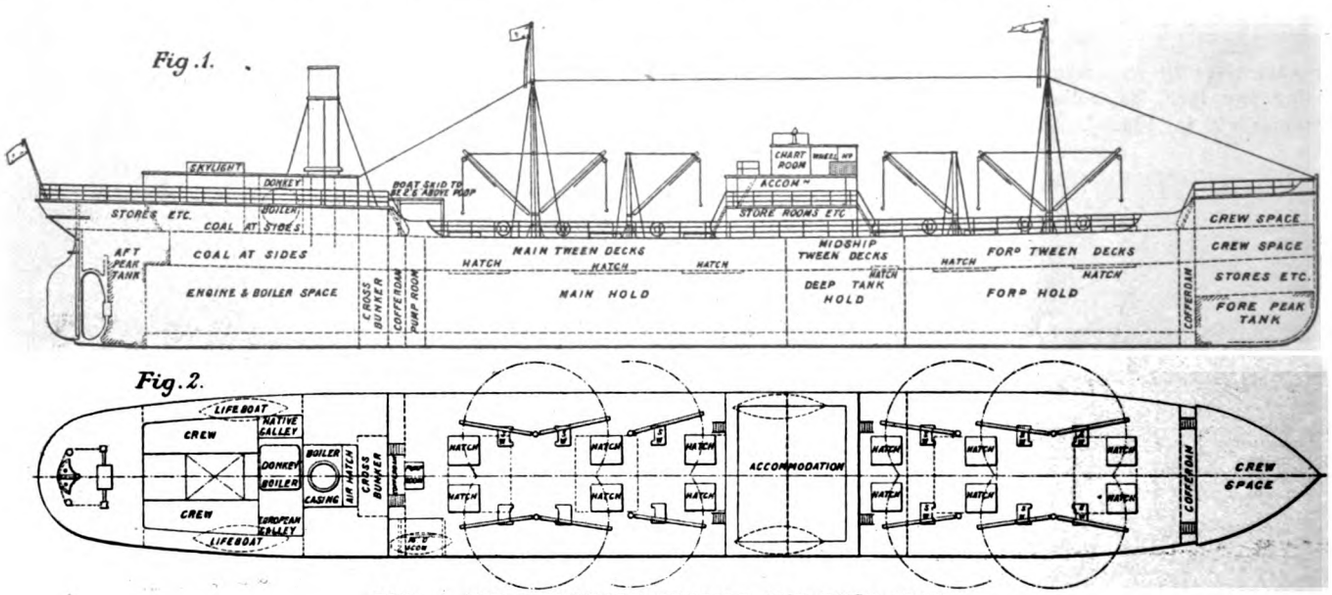
# Design of Oil Steamers*

## *A Review of the Structural Features of Tank Vessels Engaged in Oversea Trade*

By James Montgomery

THIS paper is an attempt at a brief review of the features of structural and other interest to be found in tank-vessels engaged in over-sea trade, and if any apology is necessary for introducing the subject to the members of this Institution, it is to be found in the phenomenal activity in the oil-carrying industry, which has been characteristic of the shipping history of the last eighteen months, and which is still maintained. This activity is clearly exhibited in the number and tonnage of vessels now being built to carry petroleum in bulk, and intended to be classed in Lloyds Register, there being at the present time over 90 of these vessels, aggregating approximately 480,000 tons gross, in process of construction.

Petroleum was first carried, as one might expect, in small receptacles, in ordinary cargo vessels, and in 1886, when the late Mr. Martel wrote his paper on the subject, it was possible for him to state that nearly the whole of the petroleum shipped in America for British and European ports was then carried either in barrels or in tin cases enclosed in wood boxes. As a general means of transport, however, this method was soon discontinued. The factors which operated in this direction were chiefly the cost of the barrels or tins, the loss of carrying capacity involved, and the comparatively slow rate at which the cargo could be loaded and discharged. It is advisable, however, to refer to this method here, because in some instances special circumstances make it the only method available. Where conditions at the loading port, for example, make loading in bulk impossible, the product is tinned and shipped as ordinary cargo. The method is also used where small parcels of oil have to be delivered, or where, after discharge, the cargo has to be conveyed over difficult country, badly provided with means of transport. Several vessels are now being built for this particular branch of the trade, and a design for this type is shown in Figs. 1 and 2, above. The dimensions are 313 ft. by 41 ft. 6 in. by 26 ft. 9 in., and the carrying capacity is approximately 90,000 cases, the over-all dimensions of each case being 10½ in. by 20¾ in. by 15 in. The




FIGS. 1 AND 2—INBOARD PROFILE AND DECK PLAN

*Report read before the Institution of Engineers and Ship Builders in Scotland.

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principal features of the design are shown on the drawings. The cargo is carried in two holds, the machinery is placed aft, and water-ballast is carried in deep tanks amidships and at both ends. In order to obtain the maximum carrying capacity the ship is of the awning-deck type, the weight of steel being thereby reduced to a minimum consistent with classification requirements.

When oil is carried in cases, certain precautionary arrangements are sometimes adopted, designed to minimize danger to the vessel and her crew. In the case of the ship illustrated, for example, it will be seen (Fig. 2) that the hatchways in the awning deck are of small size, and have steel covers fitted gas-tight. A separate pump enclosed in a gas-tight pump-room is provided to deal with the bilges in the holds. As the vessel is intended to carry benzine, the cofferdams shown at each end of the cargo space are a desirable safeguard, and experience has demonstrated the danger of omitting them when this cargo is carried. No accommodation is fitted directly on the awning deck, the crew are berthed forward, and the officers' quarters, etc., amidships are separated from the oil-deck by store-rooms. A very efficient system of ventilation is fitted, each hold being provided with four ventilator-pipes, 3 in. in diameter, extending to within 6 in. of the bottom of the vessel and having a steam-ejector at the top.

*Carriage in Bulk*

As is well known, however, petroleum and other oils are now almost entirely transported over-sea in tank-steamers of special design and construction. In such ships also the cargo is carried amidships; the machinery is fitted aft, and completely protected by a poop. In a typical ship, 370 ft. by 50 ft. 9 in. by 29 ft. 1½ in. to the upper deck, the oil is carried in a series of eight tanks, the longest of which are 27 ft. 1 in. in length. A pump-room is situated amidships, extending across the full width of the ship. The tanks are divided in the center by an oil-tight division which extends throughout the length of the oil-spaces, pump-room, and cofferdams. An expansion-trunk, equal in width, in this case, to one-half the width of the vessel, extends throughout the oil space from the after end of the forward cofferdam to the machinery casing to which the plating is scarphed. The 'tween deck spaces outside the expansion trunk are utilized as summer tanks. Cofferdams, or safety spaces, are fitted forward and aft, entirely isolating the oil

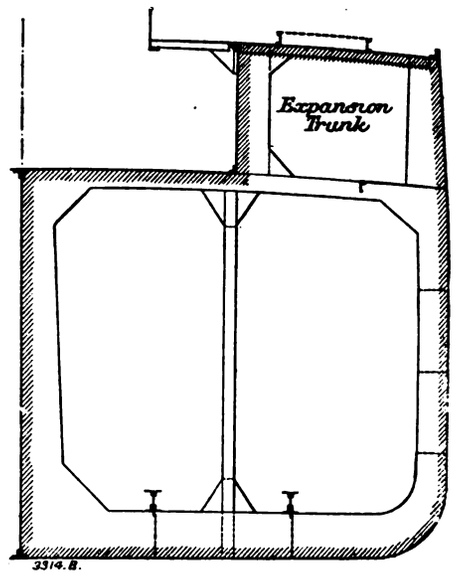


FIG. 3.—ARRANGEMENT WITH EXPANSION TRUNK AT SIDE OF VESSEL

spaces from the forward cargo hold and machinery space respectively. In reality the hold immediately abaft the fore peak, although described as a cargo hold, is rarely or never used for that purpose, and usually accommodates stores. Water-ballast is carried in the peaks and in the double-bottom spaces under the engines and boilers. An increasingly large number of oil-steamers are now adapted to burn oil fuel, and storage space for this is provided here in bunkers extending to the poop-deck. This storage space is in some instances supplemented by a long tank constructed in the bottom of the forward hold.

In a discussion of the arrangements briefly noted above the question arises, What is the correct or advisable position for the machinery—amidships or at the after end? In the early days of tank-steamer construction this was a question often debated, and practice was about equally divided upon the point. Time, however, in this, as in more weighty matters, has brought about a general agreement on the merits of the question, and, with one or two exceptions, machinery is placed aft in the oil-ships now being built.

*Position of the Machinery*

Whatever may be the advantages of this position from the shipowners' point of view, it can be said to be a desirable arrangement from the standpoint of structural efficiency. It permits the strong construction characteristic of the oil-tanks to be extended uninterruptedly throughout the midship part of the ship. With the machinery amidships, the middle line bulkhead and sides of the expansion trunk are terminated at each end of the machinery space, and arrangements must be made for tapering off this discontinuity, which is always a matter of some difficulty. This difficulty is increased by the fact that the long bridge, which is usually fitted when machinery is placed amidships, itself stops in nearly the same place. When the machinery is placed aft the structural arrangement is uniform and amidships, and it is not necessary, therefore, as in the former case, to take any steps to obviate the decided discontinuity that exists there. It may therefore be concluded that an arrangement which connotes a substantial gain in carrying capacity and a reduction of first cost to the shipowner, and at the same time is not inferior structurally, is one the adoption of which is entirely justified.

*Length of Tank*

Another point which emerges prominently from a discussion of the general arrangement of an oil-steamer is the length of the tanks in which the oils is to be carried. The saving effected by having one or two transverse bulk-heads less in an oil-ship is a consideration that sometimes presents itself with more force to the mind of the ship-builder than does the necessity for keeping the size of the tanks within reasonable limits. Such a necessity exists, however, and experience with oil vessels built before 1909 conclusively proves that the adoption of long tanks, involving, as it does, an increased mass of oil in each, results in heavy weather damage, sometimes of a widespread nature. A study of the "morbid anatomy" of oil ships will reveal this. The author has analyzed all cases of recorded sea damage in oil ships during the past thirteen years, more especially in relation to the structural arrangements of the vessels and the lengths of the tanks in each. The damage consists principally of started and sheared rivets, started caulking, and, to a lesser extent, of material deformed and fractured. In ships with long tanks, however—and by long tanks I mean those over 30 ft. in length—this latter element is more pronounced than in those having tanks of shorter lengths, and in many instances plates and angles in the longitudinal and transverse bulkheads have been deformed and fractured, revealing unmistakably the capacity for damage inherent in such large masses of oil when the ship is in a sea-way. Taking all these damage cases in the aggregate, it is found that for them the average length of tank is over 30 ft. Cases of recurring damage are especially interesting, for in them the casual element can be neglected, and in these cases, excluding two small ships more than twenty-five years old, the average

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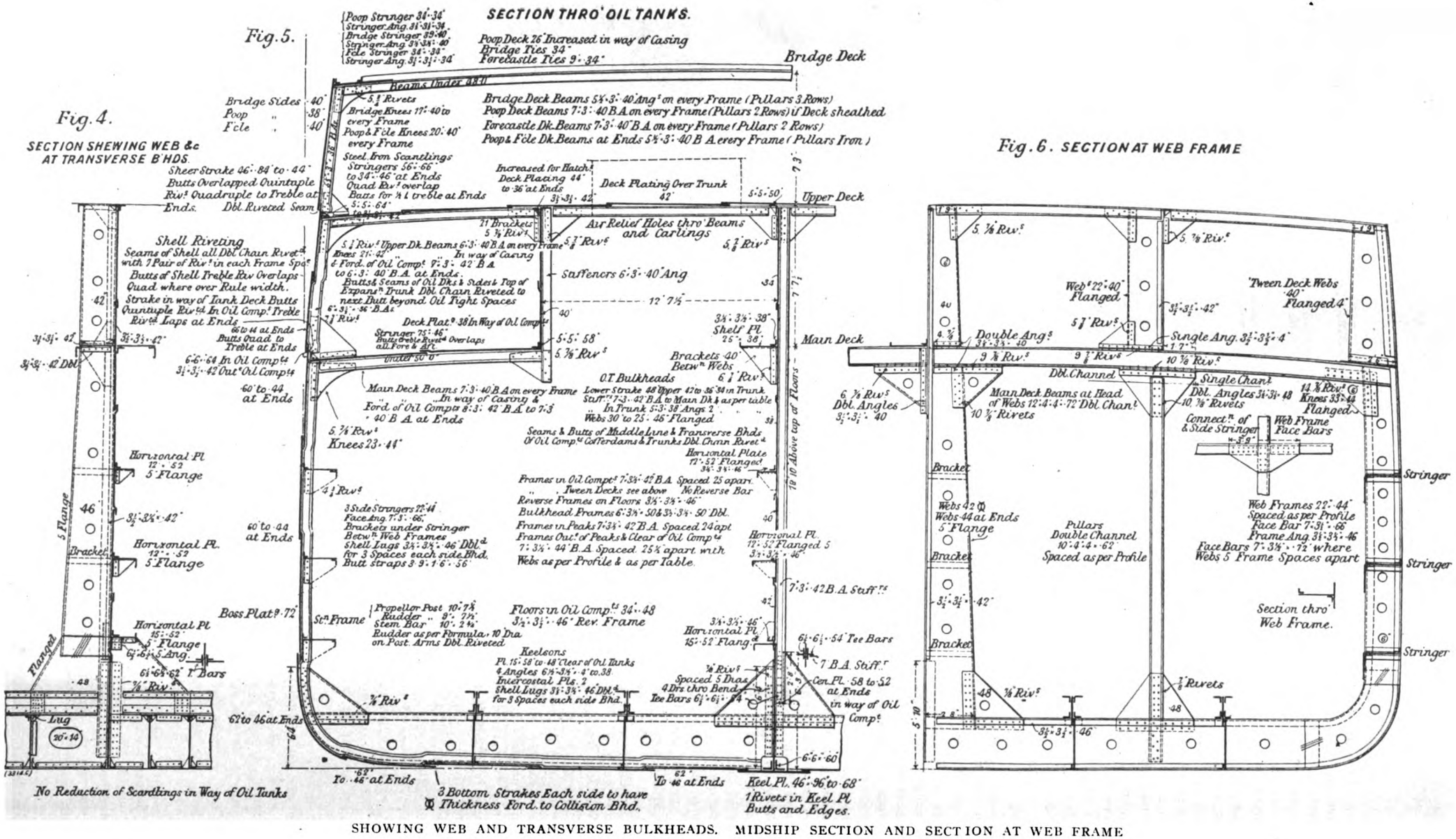


SHOWING WEB AND TRANSVERSE BULKHEADS. MIDSHIP SECTION AND SECTION AT WEB FRAME

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length of tank is about 34 ft. On the other hand, the average length of tank in all oil ships classed in Lloyds Register prior to 1908 is considerably less than that, being about 26 ft. 6 in. only. In a matter of this kind experience speaks with final and authoritative voice. Its verdict is that damage in oil ships, and particularly repeated damage, has been so intimately associated with the fitting of long tanks as to justify the conclusion that the presence of these long tanks constituted a contributory cause in the production of damage. This point was fully considered when the rules for oil vessels were approved by Lloyds Register, and in these rules the maximum length of tank permitted is 28 ft.

*Expansion of Oil Cargo*

The provision for expansion in the oil cargo, due to temperature changes, was made, in the earlier steamers, by fitting trunked hatchways, the volume of these trunks being a certain percentage of the volume of the tank to which they gave access. The coefficient of expansion of petroleum varies considerably with the density, but generally the volume of each trunk was from 3 to 4 per cent of the volume of each tank. The continuous expansion trunk now provided (see Figs. 4 to 9) is of a capacity far in excess of that required to permit of free dilation of contraction of the liquid, and is indeed less an expansion-trunk than a means of increasing the carrying capacity of the vessel. Its capacity, however, only concerns us in relation to the necessity for limiting the mass of free oil in the expansion-trunk in order, as far as possible, to avoid structural damage. It is in the expansion-trunk only that we have a free oil surface, and in order that the impulsive forces incident upon the upper boundary surfaces of the tank may be minimized, it is desirable that the width of the trunk should not exceed six-tenths the width of the vessel. When oil is carried in the wings between the upper and second decks, it is still necessary to make the same kind of provision as was formerly arranged for the main tanks, and it is a common practice to make the volume of the hatchways giving access to the "summer tanks," as they are called, 3 per cent of the volume of the latter.

The expansion-trunk is placed in the center of the vessel. In some recent vessels which it was desired to adapt for carrying oil in bulk, it was suggested that the expansion-trunk might well be fitted at the sides, instead of in the center, in order to avoid the difficulty and expense consequent upon the work of making the second deck oil-tight at the sides of the ship. To secure oil-tightness there it is necessary to cut the large bulb-angle frames, bracket them above the second deck, to fit a continuous doubling plate to cover up the slots in the deck, and a continuous double-riveted stringer angle. The placing of the expansion-trunk at the sides avoids all this, and in more than one instance the suggestion was acceptable. If the matter be further considered, however, it does not appear to be an undesirable change to make even in the case of a new vessel (see Fig. 3). The structural arrangements present no difficulty. The transverse strength can be efficiently maintained at the sides of the vessel by some such arrangement as that shown in Fig. 3, the second deck being now oil-tight in the center instead of at the sides. The middle line bulkhead would stop at the second deck, the 'tween deck portion being omitted—an economy of material and labor. The 'tween deck central space is well adapted for general cargo, and access can be had to it by central hatchways of sufficient size. The summer tank-spaces in the ordinary design, when not filled with oil, are difficult of ventilation, but in Fig. 3, only one such space exists, and the construction in it is not so cellular as it is in the wing summer tanks—a feature which facilitates the dispersal of the heavy gases which tend to accumulate there. In regard to this matter, although the facts are as stated above, the author has learned that this suggestion was made many years ago by S. O. Kendall, now a surveyor to Lloyds Register, and adopted in one or two vessels. There appears to be no sufficient reason, however, which would explain why it is not being adopted on a more extensive scale.

*Systems of Construction*

Figs. 4 to 9 show the midship section profile and deck plans of a typical oil-steamer framed on the transverse system. The dimensions are: Length between perpendiculars, 370 ft.; breadth, molded, 50 ft. 9 in.; and depth, molded to upper deck 29 ft. 1½ in. The type of framing employed is that known as the web-frame system, and with very few exceptions, and these mostly small vessels, it has been uniformly employed in transverse ships. It is, in its details, well known, and it is not necessary to do more than point out that the side of the vessel is supported by the web frames and side stringers (the intermediate frames supporting the plating locally), the bottom is supported by floors and keelsons, and the bulkheads, transverse and longitudinal, by plate webs and channel girders. The webs on the side of the ship are in the same transverse plane as the webs on the longitudinal bulkhead, and both become efficient elements in the transverse strength of the ship in respect of their being joined at the level of the second deck by specially strong beams. The stringers on the ship's side are in the same plane as the horizontal girders on the bulkheads, and form a rigid horizontal section extending round the walls of the oil compartments. The keelsons come in line with the webs on the transverse bulkheads, and the construction in other respects is clearly shown in the drawings reproduced.

*Rigidity of Girders*

It has just been said that the side of the vessel is supported by web-frames and side-stringers, and the bottom by floors and keelsons, and this type of ship is the only one of which so unqualified a statement can be made. Of an ordinary cargo vessel one would require to say that the side was supported by the web-frames only, and the bottom by floors only. The difference is due, of course, to the positions of the bulkheads in the two cases. In a transverse oil-ship the close spacing of the bulkheads converts the side-stringers and keelsons on the sides and bottom into supports almost as efficient as the web-frames and floors against external loads. Thus, assuming that the same scantlings of the vessel shown in Figs. 4 to 6 are worked into an ordinary cargo ship of the same size, a simple investigation will show that the strength of the side in the former case will be twice that in the latter, while the rigidity also is twice as great. The efficiency of these longitudinal girders, in this connection, depends on their end connections and on the spacing of the water-tight bulkheads. If the bulkheads are widely spaced, then for the same scantlings the strength and rigidity of the sides and bottom are materially reduced. It has been seen that long tanks lead to increased impulsive forces on their boundary surfaces, but it is no less true that for the same material they also imply diminished capacity to resist them.

The author would here point out another distinguishing feature of this system—that is to say, the very great rigidity it is possible to obtain in the

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end attachments of the various principal girders. These girders do not terminute on unsupported plating, but are attached at their ends by strong flanged brackets to other girders as rigid as themselves. The importance of securing rigid end attachments is not always realized. Because of the damage which has been found to occur at the stringer and keelson connections at the bulkheads, damage which has frequently taken the form of sheared and started rivets, it has been argued by some that it was the very rigidity of the structure which had there concentrated stress and localized injury. It has been argued, too, that a relatively flexible construction is better adapted than a more rigid one for an oil-vessel, and the substitution of "deep" frames for web-frames, for example, has been proposed. The author does not think that such contentions are founded in reason, or justifiable on an examination of all the facts. It is true, indeed, that the maximum flexural strength is obtained from any girder fixed at the ends when the bending moment in the middle is equal to that at the ends, a condition predicating a definite slope at the ends. It is therefore a sound practice shipbuilding this may be said to be an ideal condition, and any attempt to secure in practice so nice an adjustment will almost certainly result in an increase of the maximum bending moment with a change in its position as a necessary correlative—that is, an increased stress and greater resultant failure somewhere else than at the ends. tI is therefore a sound practice which aims at employing that type of girder the form of which gives the greatest possible amount of rigidity, and which endeavors to approximate as far as possible to a condition of fixity at the ends of the same.

*Little Change*

The construction shown in Figs. 4 to 9 has not exhibited much change since oil-vessels were first built, but there is no reason why suitable modifications should not be adopted. These to be successful should follow the modern tendency to be observed in the case of other merchant ships, a tendency towards simplification of construction and a reduction of the number of parts, associated with a close correspondence with the requisite standard of strength. The bulkhead, for instance, could be so modified by increasing the strength and stiffness of one set of girders as to permit of the reduction or elimination of others. The strength and stiffness of the horizontal girders on the bulkheads, for example, could be so increased as to permit of a reduction in the number of webs, or, indeed, they might be made of such scantlings as would support the entire load on the bulkheads from the side to the center.

(To be continued.)

## New Spanish Mail Steamer

The Reina Victoria-Eugenia, a Spanish mail and passenger steamer of the very highest class has just completed her trial and is on the point of leaving the Tyne. She has been built at the Neptune works of Swan, Hunter & Wigham Richardson, Ltd., and is propelled by four screws, two of them being driven by twin-screws, four-crank, triple-expansion engines balanced on the well known Yarrow, Schlick & Tweedy system, and the two outer propellers are driven by low pressure turbines, which have been supplied by The Parsons Marine Steam Turbine Co., Ltd., Wallsend.

The steamer is 480 ft. in length, 61 ft. beam and 35 ft. depth, and is classed in the highest class of Lloyds Register, and is also classed by the Registro Italiano for the purpose of carrying emigrants from Italy to South America. She also complies with Board of Trade requirements as a passenger steamer.

The prevailing idea in the design of the vessel has been safety and luxury. The safety of the passengers is ensured by the vessel being divided into a large number of watertight compartments, the bulkheads dividing which have quick closing doors on the Stone-Lloyd system, worked from the flying bridge. As a further measure of safety there are fitted wireless telegraphy, Clayton's system of fire extinguishing apparatus and submarine signalling, together with an ample supply of lifeboats, collapsible boats, etc. The ventilation which, as the vessel will run through the tropics, is a question of prime importance, will be ensured by means of many electrically-driven fans. There is also fitted an isolated hospital where infectious diseases may be dealt with. An electric passenger lift and a gymnasium have also been fitted up.

The question of the propulsion of the vessel has been the subject of much care and thought, and the combination of twin screw reciprocating engines with two low-pressure turbines, the latter taking their steam from the low pressure cylinders of the reciprocating engines, has been adopted after careful consideration. This combination of reciprocating engines and turbines has been advocated by Swan, Hunter & Wigham Richardson for some considerable time for vessels of large size and good speed, and the results obtained on the trials of the very great economy in fuel consumption to be gained by the adoption of this system.

Although the weather on the trial trips was not of the most favorable description, the highly satisfactory speed of over 18½ knots per hour was attained.

The steamer will carry no less than 2,100 passengers, divided into 250 in the first class, 100 second class, 80 third class and a large number of emigrants.

The accommodation for the first class passengers is amidships and consists of public rooms, including a social hall, gallery and restaurant, music room, library and writing room, smoking room, veranda cafe, dining room, and vestibule and inquiry office. The hall is in the Georgian style, the music room and libary are in the Louis XVI style and the smokeroom is Jacobean.

## Battleship Pennsylvania

The act of congress of Aug. 22, 1912, provided for the construction of the new battleship Pennsylvania at a cost for hull and machinery not to exceed $7,425,000. The total cost of the vessel will be about $14,173,000. The vessel will be the largest of this class yet designed for the United States navy.

The plans contemplate a vessel of the following characteristics:

Length, 600 ft.
Breadth, 97 ft.
Draught, about 28 ft. 6 in.
Displacement, about 31,000 tons.
Main battery of twelve 14-in. guns, and four submerged torpedo tubes, supported by a torpedo defense battery of twenty-two 5-inch guns.

The vessel will be heavily armored and will have oil burning boilers of the watertube type. Several types of machinery are under consideration, but the type to be finally adopted has not yet been definitely determined.

The Polland Co., Portland, Me., has been awarded contract for the construction of a towboat for the Commercial Towboat Co., of Boston, to be 142 ft. 9 in. long, 26 ft. 6 in. beam and 15 ft. 11 in. deep. The hull is to be built by the Cobb-Butler Co., of Rockland, Me.

The torpedo boat destroyer Parker was launched at Cramps, Philadelphia, last month, being christened by H. W. Hand, vice president and general manager of the company. The Parker is 305 ft. in length, 33 ft. 6 in. beam and 8 ft. deep.

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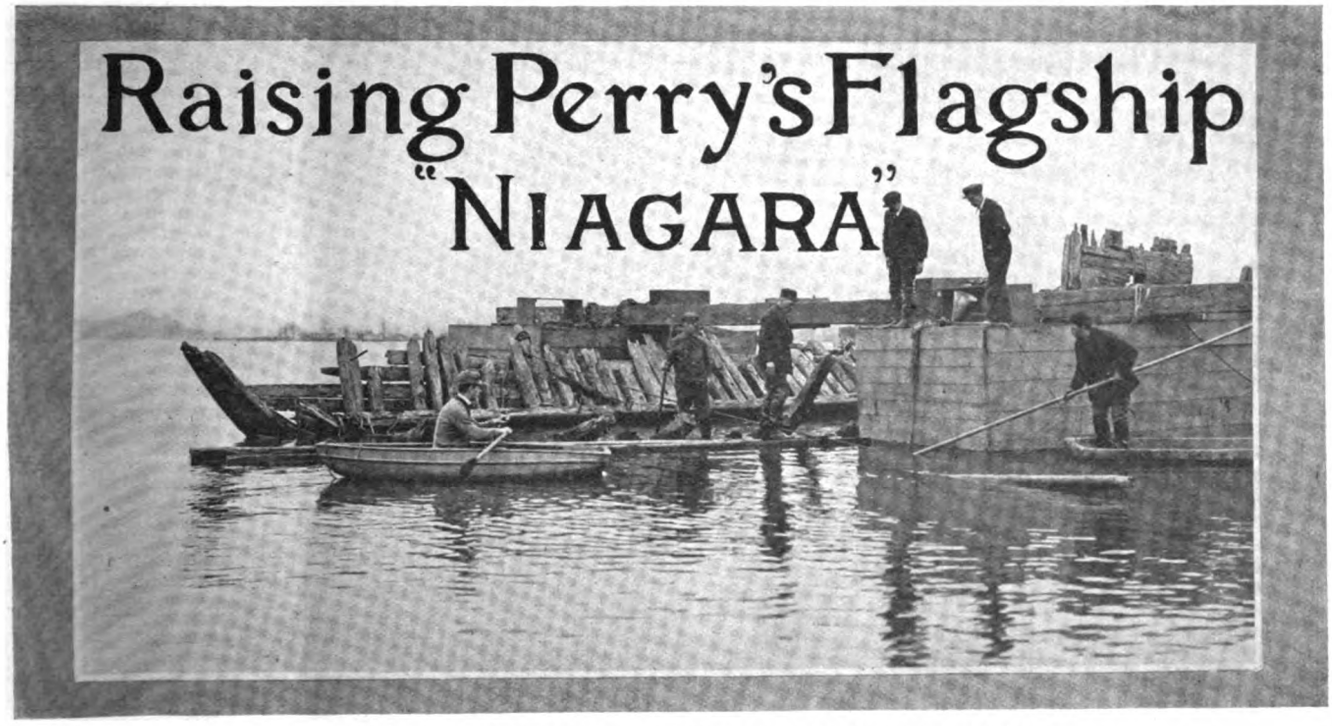
# Raising Perry's Flagship "NIAGARA"



THE BOW OF THE NIAGARA EXTENDING BEYOND THE PONTOONS

FACING conditions which retarded the work constantly, William Paasch, an Erie contractor, has completed the stupendous task of raising the Niagara, Perry's battleship in the war of 1812, from the bottom of Misery Bay at Erie. Today the old "ship of the line" lies protected in a roughly built shack on Presque Isle, safe from the elements and hundreds of curio-hunters who daily seek to obtain a splinter from the gnarled ribs. Soon, the Niagara will be reconstructed and ready for her last cruise when she will sail from Erie to Duluth, Minnesota, during the Perry Centennial celebration this summer.

But for the fury of the winds and waves the Niagara would have been beached three months ago. The bay has been a mass of ice for many weeks and only recently were the workmen able to resume their labor with any degree of success. Four pontoons which were anchored over the Niagara before the water froze have been locked in, blocking the work entirely. In zero weather the men cut holes in the ice through which they dropped pipes to the Niagara and blew out sand and clay from the hold. They worked in greatcoats and boots and frozen fingers were common. Even after the ice started to melt their task was well near impossible because of the danger of falling through. Many times, men crashed into the icy water and were rescued by comrades.

A 30 ft. crane was erected upon the stern pontoon and chains connecting with the beams of the Niagara were attached. When the engine in the pontoon was started, the crane lifted slowly, raising the old hulk from the bottom and, at the same time propelling the whole line of pontoons toward shore bearing between them their historic burden. Four chains were slung beneath the Niagara, one at stern, two

LOOKING DOWN UPON NIAGARA

amidships and one at bow. Those amidships relieved the pressure when the engine was working and consequently the old battler was lifted intact. The idea belongs to Paasch and was worked out against the advice of some who were confident that the Niagara would split amidships with the pressure.

As she lay when the work began, the Niagara was 110 ft. long and 30 ft. beam, the measurements corresponding to those given in historical papers. The fact that bayonets and relics of the war of 1812 were found in the hold, proves beyond a doubt that the ship lying on Presque Isle today is the Niagara. Some there were who doubted, but Paasch himself is confident that his work has not resulted in the resurrection of some old dry-dock or canal boat. Several weeks before the Niagara was lifted from the water, the gunports came to the light of day. They were 10 ft. apart, 4 ft. high and 3 ft. wide, ten on the starboard and ten on port. History gives similar dimensions to the Niagara, so it is believed the question is settled beyond all dispute.

After the water had been probed before the work of raising began, in order to ascertain the dimensions of the sunken hulk, the pontoons were floated over to the bay and placed directly above. One was anchored at each end and one on either side, thus protecting the Niagara from waves and debris in addition to serving as working platforms for the men. From the decks of the starboard pontoon pipes were dropped and with a pressure engine the sand and clay in the hold of the Niagara was blown out. Steam was kept up to 90 lbs. day and night, yet the driver on the engine barely moved so great was the resistance. Through the same pipes, when the clay had been cleared out, chains were shot

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and picked up with hooks from the port pontoon. In that manner the chains were slung under the Niagara and drawn taut, forming a hammock in which the old battle ship swung safe.

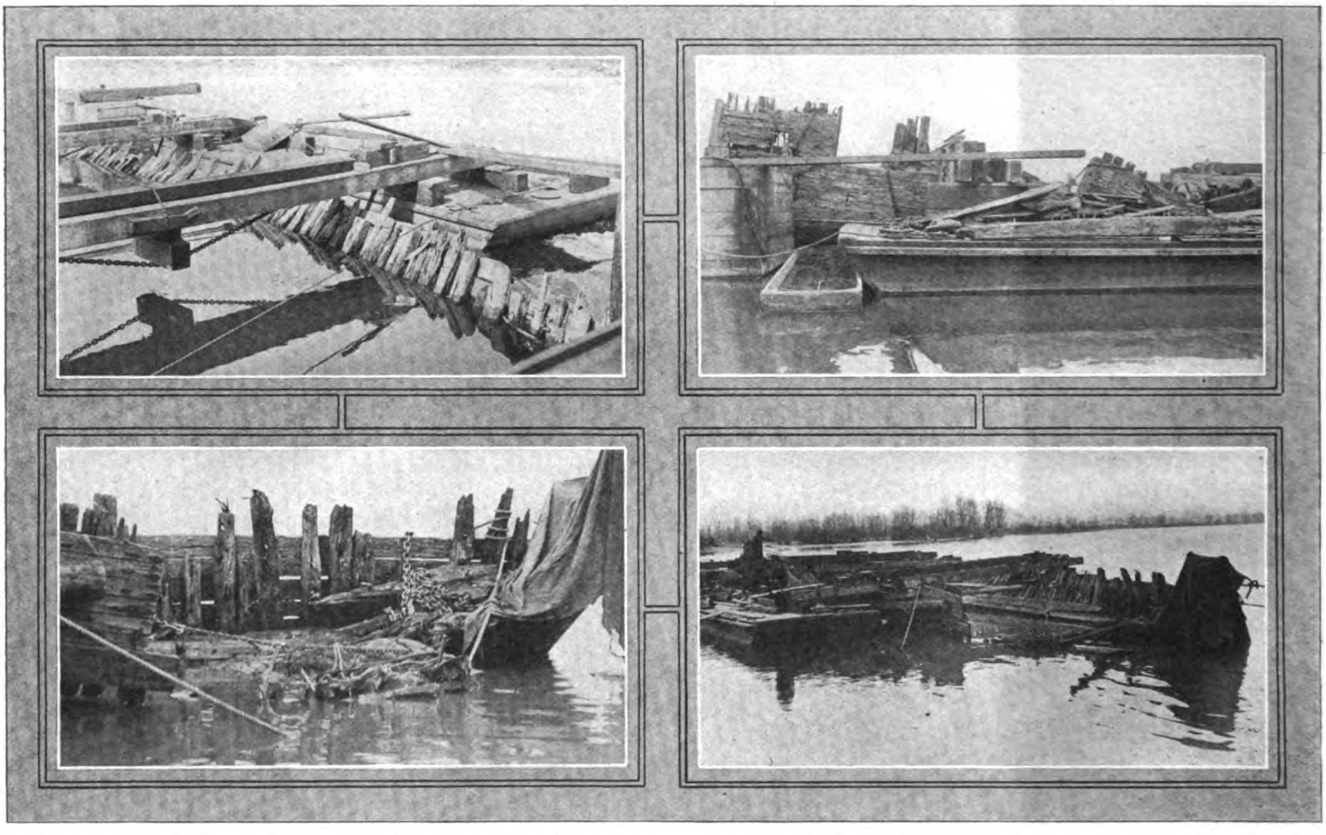
No sooner had the hammock been placed than the storm broke and the bay froze 20 in. deep. The men worked fifteen hours a day cutting blocks of ice which were lifted out and through the holes, endeavored to raise the Niagara inch by inch to the ice. When she was brought up 8 ft., her ribs touched the ice and the work was delayed for a month. The hulk could be raised no higher until the ice broke. When it started to melt the old battler was protected with difficulty. Only the pontoons on all sides saved her from destruction. Ice banked up about the pontoons 10 ft. high and battered them steadily. Repairs were necessary when the first signs of spring arrived and after that the work was rushed as much as possible.

The engines were kept up to their highest pressure and the big crane on the stern pontoon worked steadily lifting the Niagara inch by inch. For hours but two links of the "chain hammock" would appear above the water. Had the engine been "jerked" the chains probably would have pulled through the water-soaked wood of the old craft, dropping her to the bottom of the bay where she had rested for almost a century. For that reason, Paasch was careful. His every order was deliberate and the men were under a constant strain. Their desire to accomplish the task within the specified time caused them to hurry the work sometimes and "Bill" was the man who always held them back. It was too delicate a task to rush and he knew it.

Not long ago, the crane reached its full height, rearing into the air thirty feet. It stood perpendicular and the chains from the pulley at the top were stretched taut to the battered hulk below. When the crane was first erected it stood 300 ft. from shore and when it was at its fullest height it was but 10 ft. away. As slowly and as steadily as the Niagara had been lifted the pontoons had moved toward Presque Isle. With them went the Niagara. So far as lifting the hulk was concerned then the work was completed. All that remained was to slide it upon "butter-boards" and tilt them toward the shore. "Butter-boards" were huge timbers coated liberally with grease, over which the Niagara slipped rapidly to shore, held back by the ropes and chains connected with the pontoon.

Once beached, the shelter house was erected and again the Niagara was pushed forward. She stands today, broadside alongshore, in the shelter house. In the water, she lay with stern pointed Erieward and bow to the open sea, facing the storms and waters as she did that memorable day when Perry sent his message from her decks, "We have met the enemy and they are ours."

After her trip around the Great Lakes the Niagara will be returned to Erie, where she will be a lasting relic for posterity.



NIAGARA EMERGING FROM THE WATER, SHOWING PORT SIDE BETWEEN PONTOONS BOW OF NIAGARA

SHOWING BOW OF NIAGARA ABOVE THE PONTOONS PUSHING NIAGARA TOWARDS THE SHORE

## Oil Tanker San Fraterno

The oil tanker San Fraterno was launched from the Wallsend shipyard of Swan, Hunter & Wigham Richardson on Feb. 22.

The San Fraterno is 541½ ft. long over all with a breadth of 66½ ft. She is designed to carry 15,500 tons of oil on a draught of 28 ft., and her speed on a fully loaded trial is to be 11¼ knots. The ship is the largest oil-carrying steamer afloat in the world, though the owners have altogether ten of these great ships under construction, three being built at the Wallsend shipyard. The owners also have a

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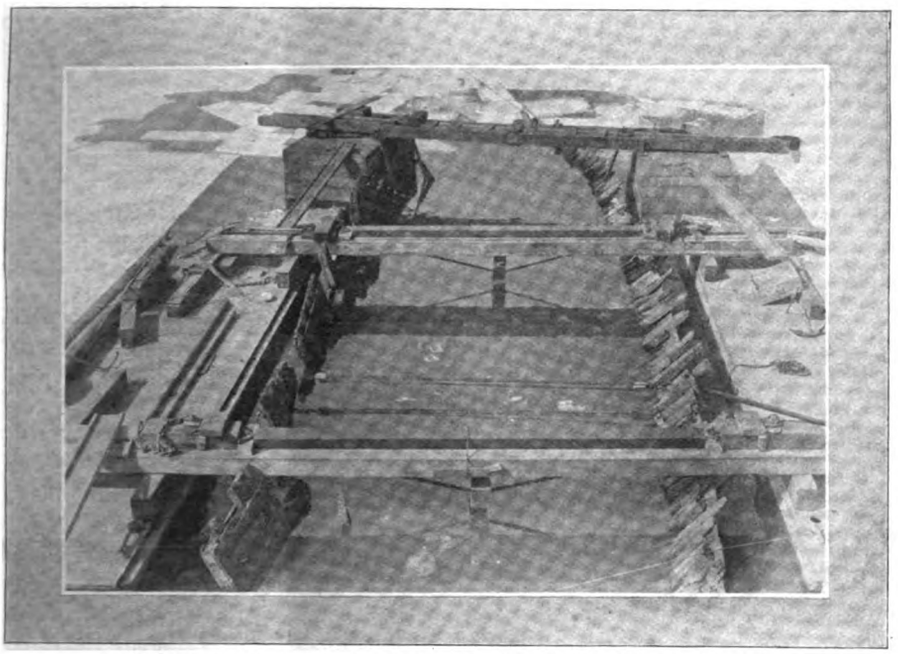

VIEW OF NIAGARA BETWEEN PONTOONS LOOKING FORWARD

number of 9,000 ton oil-carrying ships being built, some of which are also in the hands of Messrs. Swan, Hunter & Wigham Richardson, Ltd.

The San Fraterno has been built upon the Isherwood system with longitudinal framing to the highest class of Lloyds under special survey. The oil holds and bunkers are divided into fourteen compartments by transverse bulkheads and are further sub-divided by a central longitudinal bulkhead which is carried through all the holds, pump rooms and cofferdams. There are two cofferdams five feet in length at each end of the range of oil holds.

The quadruple expansion engine and the boilers have been built by the Wallsend Slipway & Engineering Co., Ltd., and will be placed in the after end of the ship, fitted with the Wallsend-Howden patent apparatus for burning liquid fuel.

The accommodation for the captain and his officers will be most comfortable, and will be in the bridge house amidships. The engineer's cabins will be fitted in the poop and close to them will be the crew's quarters. Wireless telegraphic apparatus will be fitted and it may be said that the San Fraterno in every detail of design, in the installation of oil pumps, in the main engines and auxiliary machinery and in all items of outfit, will represent the most modern and approved type of steamship for carrying oil.

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J. S. Harland has been appointed coal and dock agent at Marquette, Mich., vice H. B. Bell, resigned.

## Want Gen. Uhler Retained

The National Board of Steam Navigation, through Fred B. Dalzell, its president, and H. L. Joyce, its secretary, has petitioned President Wilson to retain George Uhler, supervising inspector of the steamboat inspection service, in office. In this request they are supported by practically all the steamship interests of the country. Mr. Uhler is the only man on the board of supervising inspectors who is a practical engineer. The petition reads:

"Whereas, George Uhler, supervising inspector general, has for the last ten years discharged the duties of his important office with great ability, acknowledged efficiency and absolute impartiality, and whereas his incumbency in said office has demonstrated to everyone doing business with that office his recognized and admitted fitness, his practical knowledge of the navigation laws, his personal familiarity with the conditions existing over the great waterways of the country over which he has jurisdiction, his business capacity and eminent executive ability as well as his fairness to both employer and employe on all questions submitted to him for decision.

"Whereas, That we, the owners and operators of 80 per cent of the floating equipment of the port of New York and adjacent waters, urgently urge upon the president of the United States and the honorable secretary of commerce the importance of retaining him in the position which he now occupies."

The National Board also recommends the retention of Henry M. Seely as supervising inspector in New York harbor, certainly the most important post in the steamboat inspection service, saying:

"From our point of view, having as we do at all times almost daily relations with these two officers of the government, we feel it would be a great mistake for the steamboat inspection service to lose the service of either one of them, and we earnestly and most respectfully urge upon his excellency, the president, and the honorable secretary of commerce their retention.

"We feel that we do not only represent the sentiments of the employer, but the vast majority of licensed officers employed on all vessels coming under their jurisdiction."

SHOWING NIAGARA LYING BETWEEN PONTOONS LOOKING AFT. NOTE GUNPORT ON THE PORT SIDE FORWARD

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# Salving the Dora

## *The Vicissitudes of a Vessel Plying in One of the World's Most Northerly Routes*

THAT the little, wooden passenger and freight steamer Dora, which plies regularly on the most northerly steamship route in the world, bears a charmed existence is the generally accepted opinion along the north Pacific coast. After another experience, during which it was feared that the vessel was about to fall prey to the elements, the Dora is back in Seattle, undergoing repairs. Shortly she will leave for Alaskan waters, there to resume her route from Seward to ports along the Aleutian islands and into Bering sea in the summer.

Of 217 tons net and built at San Francisco in 1880, the Dora has probably had more narrow escapes than any other vessel on this coast. Time and again she has been given up for lost, but eventually she has reappeared. It is a regular occurrence for the Dora to go ashore on some of the treacherous uncharted reefs or shoals in Alaskan waters. Her most recent adventure in blowing ashore at Seward during a terrific December gale almost ended the vessel's career, but by good salvage work she was pulled off the beach and after many discouraging efforts finally made Seattle under her own steam, for repairs.

During the stormy and dreary winter months, when the north Pacific is a raging sea, when terrific storms sweep that wide expanse, when the few inhabitants of the little ports on the Aleutian islands as far west as Dutch Harbor at Unimak Pass, leading into Bering sea, are practically cut off from the outside world, the Dora makes monthly calls. She brings the mail and good cheer. News is distributed by her officers who play the role of minister, doctor, mailman and many others. Oftentimes the weather is so severe that it is impossible to land, whereupon the unfortunate inhabitants are compelled to postpone the pleasure of hearing from the outside for another month, when the vessel returns.

Through these raging storms, usually accompanied by blinding snow and bitter cold, the Dora plows her way, ice coated, battered and beaten by the elements. But Uncle Sam's mail must be delivered and the Dora must fulfill her contract. In the summer she extends her monthly itinerary into Bering sea to call at the port of Nushagak where, during the summer, hundreds of sturdy salmon fishermen and packers are engaged in harvesting the annual crop.

STEAMER DORA ASHORE WITH THE CORDOVA AND MARIPOSA HAULING AT HER

Having just completed her monthly voyage to the westward, the Dora returned to Seward in December when, during a high gale, she broke loose from the wharf and before she could be moored, was drifted upon the beach where heavy seas struck the prostrate hull and doing much damage. She took an alarming list, the steam pipes were broken and several attempts to pull her off with the regular liners from Seattle were unsuccessful. Then for three weeks strenuous efforts by competent salvage operators followed, the San Francisco board of marine underwriters sending a representative to Seward to superintend the work. That it was finally successful speaks well for the ingenuity, skill and perseverance of the salvors for they were severely handicapped by terrific gales, unusual cold and lack of necessary equipment. For a time the vessel lay with a 40 degree list and her hull was filled with water. An 8-inch Morris pump, weighing 5,300 lb., was taken to the beach in sections and hauled on board with boom tackle. With this and a gas pump, operations were started, but cold weather interfered greatly, at times it being 3 degrees below zero, and each morning it being necessary to thaw out the pumps. The frozen condition of the tackle one day caused the vessel to slip back after she had been hauled up to six degrees starboard list. Temporary repairs were made to the garboard seam, which was open for an inch for 35 ft. At low water a trench was excavated under the keel. Finally, by means of a double tackle with a coil of 4-in. rope made fast to the wharf the Dora was released. On the long passage to Seattle, the vessel leaked alarmingly, and it was necessary to frequently seek shelter and overhaul the pumps. At Shakaan it was necessary to replenish the water supply by buckets from shore, the water pipes in the town being frozen. The Dora reached Seattle, six week after she went ashore, and Pacific coast marine men agree that this was one of the best salvage jobs done in Alaska in years.

### *Noteworthy Experience*

The Dora's most noteworthy experience was eight years ago, when she disappeared for six weeks. While on her route to the Aleutian islands she encountered a heavy storm. Unable to make shelter she was driven to sea. Repeated efforts to return were unavailing until with bunkers empty and starvation facing the crew, Capt. Zim Moore rigged up a sail and ran into Puget Sound, 2,000 miles from the Aleutian islands, after all hope had been abandoned for the vessel. She had made nearly 4,000 miles during the time she was lost and once was blown close to the Ha-

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waiian islands. Last summer, during the eruption of Mount Katmai, the Dora was in the thick of the volcanic storm and it was feared she was lost. However, she reappeared in time to render aid and assistance to the stricken natives and to maintain her reputation as missionary. The Dora will shortly return to the north to resume her hazardous route, which is probably the most dangerous in the world.

# Puget Sound Dry Dock

## *The Navy Department Dedicates Its Second Dock at the Bremerton Navy Yard*

THE completion of the second dry dock at the Bremerton navy yard, Puget Sound, has relieved the fears of the officials of the navy department, who were somewhat worried by the recent collapse of a portion of the large dock now being constructed at Pearl Harbor, near Honolulu. The new dock at the Puget Sound station offers facilities for the largest vessels on the Pacific coast and it will be sufficient to accommodate all the vessels likely to be stationed on that coast after the opening of the Panama canal.

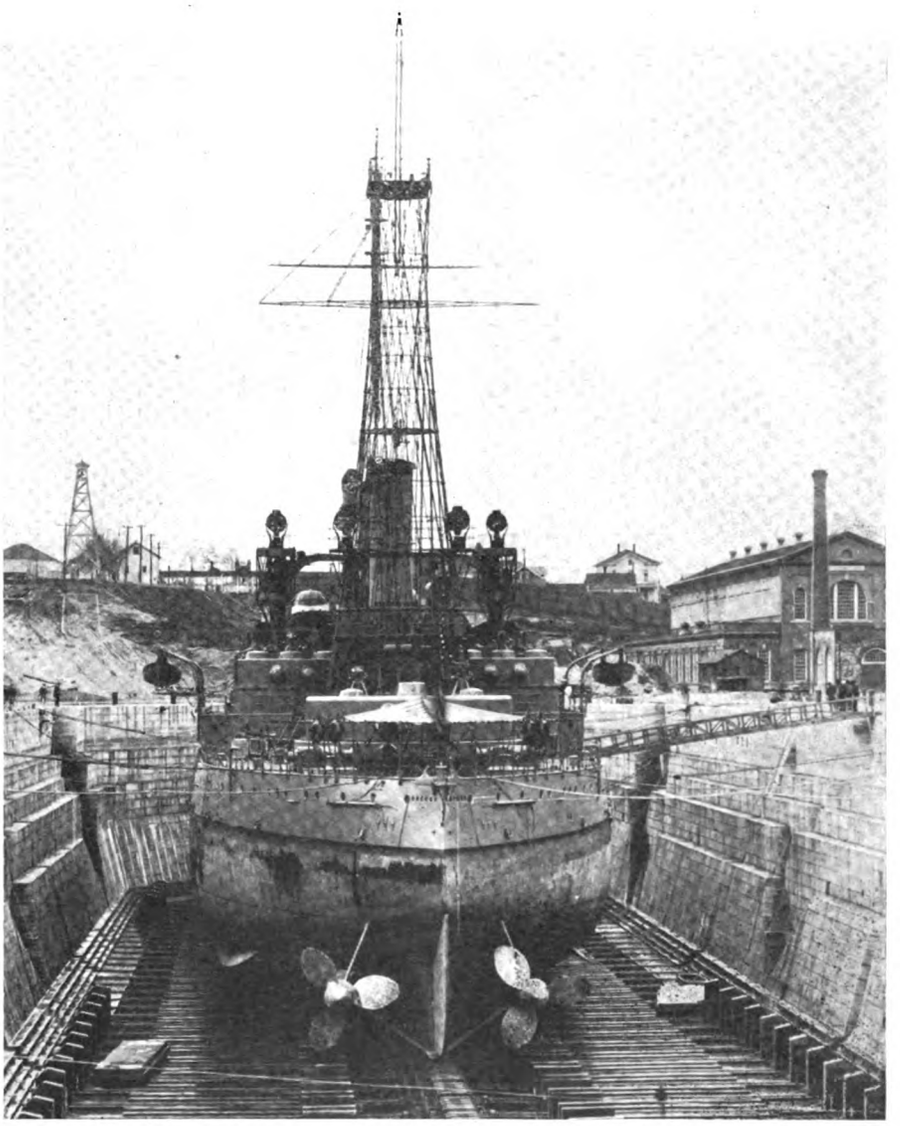
On March 1, with imposing ceremonies participated in by federal, state and local officials, the new dock at the Puget Sound yard was formally opened. The occasion marked an epoch in the north Pacific, for it means that the Puget Sound yard has taken its place as one of the principal naval stations in this country. There is no question that the yard will assume a more important aspect with an increased naval squadron certain to be assigned to Pacific waters upon the opening of the Panama waterway. The Puget Sound station is most advantageously situated. There is ample room for growth and there is sufficient depth to accommodate the largest vessels likely ever to be built. The channels leading to the yard are free of obstructions and every possible advantage obtains.

The new dock was formally placed in commission when the historic battleship Oregon entered the basin. It was especially fitting that a Pacific-coast built vessel should have this distinction and residents of Puget Sound were especially pleased that the honor fell to the beloved Oregon.

Although the Oregon only a few years ago was one of the great vessels of the United States navy, she seemed a little thing in the big dock.

The new dock cost approximately $2,300,000 and required about four years to build. According to the original plans the contract price was $1,625,000. Work was started, Jan. 3, 1909, but early in the following year the original plans were found inadequate in size and the dimensions were increased. The width was made 14 ft. greater so that the new dock can accommodate any vessel that can pass through the Panama canal. These changes in the original plans increased the cost, the second contract being for $1,863,095. Still further changes were made in the dimensions eventually bringing the contract price up to $1,892,315.60. The immense steel caisson was constructed by the Seattle Construction & Dry Dock Co. for about $125,000, so that the total cost is close to $2,300,000.

The new dry dock, the largest in the navy, is equipped for handling great vessels with economy, safety and dispatch. Its dimensions are: Length over all, 863 ft.; breadth, 153 ft.; width at top of keel blocks, 110



THE BATTLESHIP OREGON, THE FIRST VESSEL TO BE DOCKED IN THE NEW PUGET SOUND DRY DOCK

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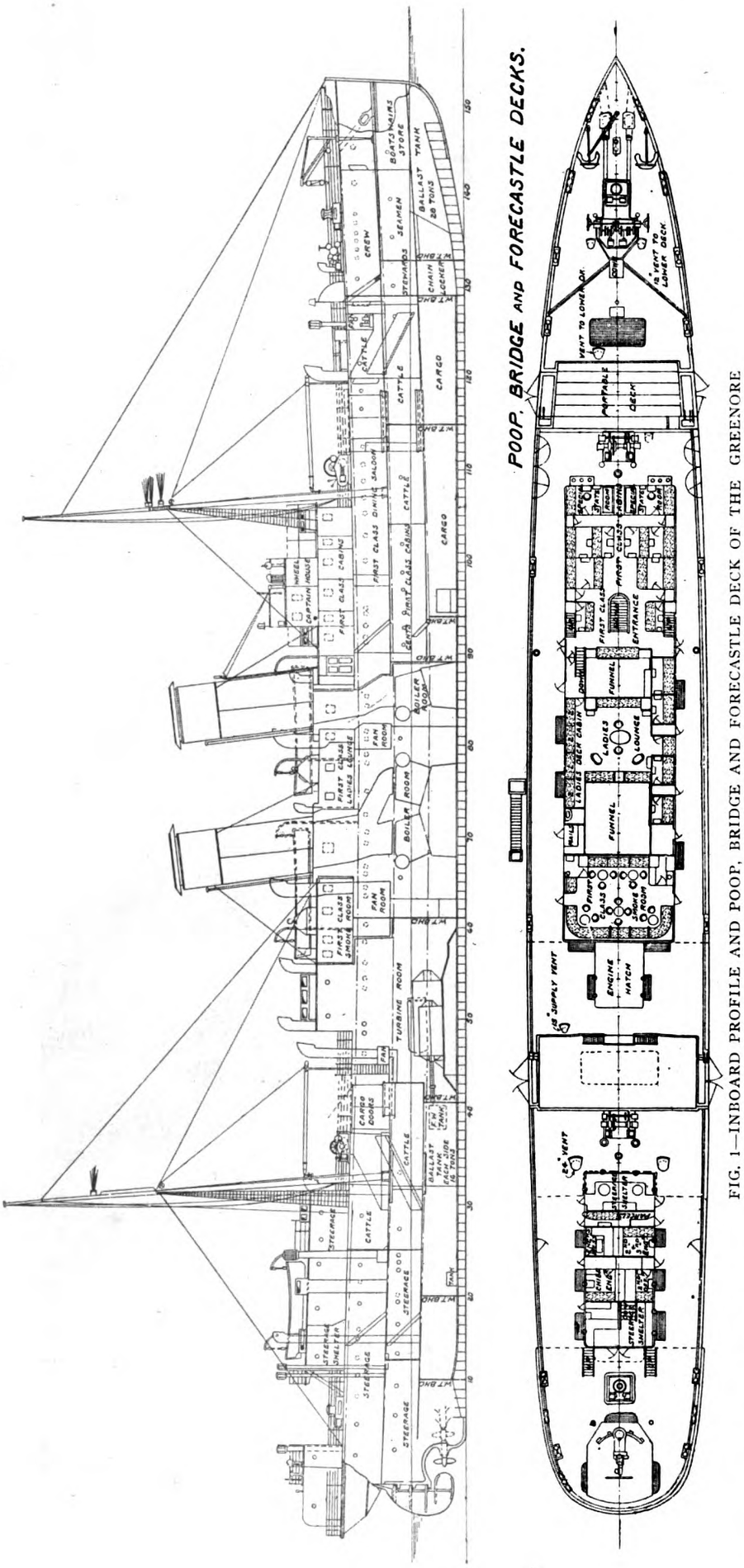


FIG. 1—INBOARD PROFILE AND POOP, BRIDGE AND FORECASTLE DECK OF THE GREENORE

ft.; depth, 47 ft. Ample depth is to be found in the approaches so that there is no danger of grounding, even for the largest vessels. The construction of the big dock called for 112,000 cu. ft. of concrete and 236,000 cu. ft. of granite taken from the Index quarries in this state. For keel blocks, 400,000 ft. of Australian tallow wood was imported and a like amount of Virginia white oak was used. In making ready for the actual construction work, 60,000 cu. yds. of earth were dredged and the earth was removed 8 ft. below the bottom of the dock. The concrete is carried to a depth of 17 ft. on the bottom and tapers to 12 ft. on the sides.

At the trials, navy officials were particularly pleased at the showing made by the pumps, which emptied the basin in 1 hour and 10 minutes, which was 20 minutes less than was expected. The basin can hold 35,000,000 gallons of water. The pump equipment has proved ample for any demand that may be made upon it. Water can be emptied at the rate of 264,000 gallons per minute. In addition to the main pumps, two smaller pumps are in service to keep the basin free of seepage.

## Turbine Steamer Greenore

The London & North Western Railway Co. have recently put their first turbine steamer in commission in the Holyhead and Greenore service. She is named Greenore and is the product of Cammell, Laird & Co.'s yard at Birkenhead. Her general arrangement and structural design are shown in Fig. 1 and Fig. 2. The large deck house on the poop and bridge decks, as well as the 'tween deck space and lower deck amidship are fitted up for the accommodation of first and third class passengers while the open space on the main deck is arranged for the carriage of horses and cattle.

Sleeping accommodation is provided for about 176 first-class passengers in state rooms and in the ladies' cabin. In addition to the ordinary cabin accommodation there are two cabins de luxe which are each provided with single bedstead, writing table, easy chairs, sofa, portable electric lamp and other fittings and will bear comparison with the cabins of any ocean line.

The first-class dining room, which is situated on the main deck forward of the boiler casing, is framed and paneled in oak. The first class smoking room is on the bridge deck and is also paneled in oak. The ladies' first class cabin is on the main deck amidships, adjoining the dining saloon, and

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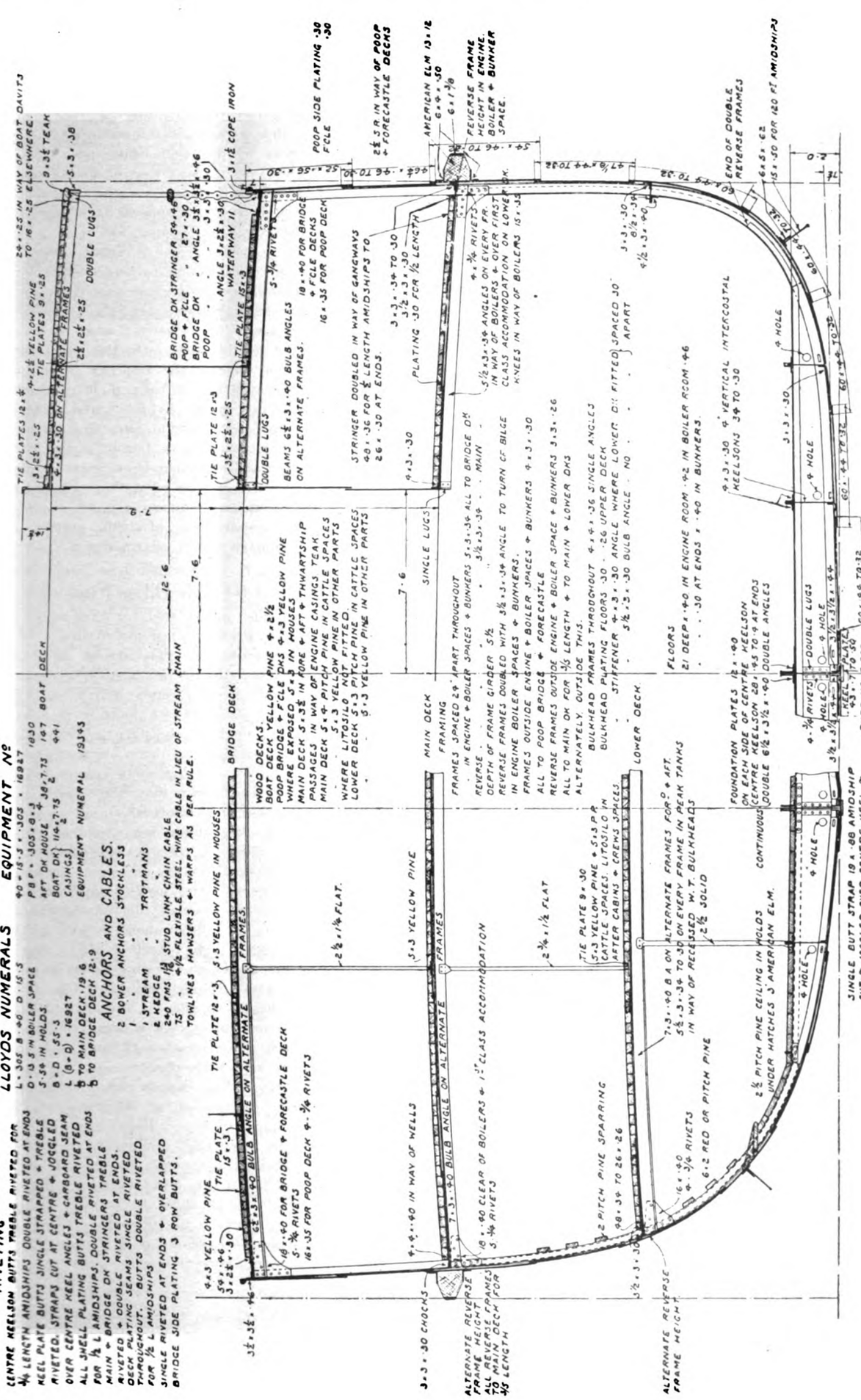
RIVETING
CENTRE KEELSON BUTTS TREBLE RIVETED FOR ¾ LENGTH AMIDSHIPS
KEEL PLATE BUTTS SINGLE STRAPPED + TREBLE RIVETED. STRAPS CUT AT CENTRE + JOGGLED OVER CENTRE KEEL ANGLES + GARBOARD SEAM
ALL SHELL PLATING BUTTS TREBLE RIVETED FOR ½ L AMIDSHIPS
MAIN + BRIDGE DK STRINGERS TREBLE RIVETED + DOUBLE RIVETED AT ENDS.
DECK PLATING SEAMS SINGLE RIVETED THROUGHOUT. BUTTS DOUBLE RIVETED FOR ½ L AMIDSHIPS
SINGLE RIVETED AT ENDS + OVERLAPPED
BRIDGE SIDE PLATING 3 ROW BUTTS.
LLOYDS NUMERALS
L · 305 B · 40 D · 15·5
D · 3·5 IN BOILER SPACE
3·5¾ IN HOLDS
B + D · 55·5
L (B + D) · 16927
½ TO MAIN DECK · 19·6
½ TO BRIDGE DECK 12·9
EQUIPMENT Nº
40 + 15·5 + ·305 + 16927
P&F · ·305 + 8·5
AFT DK HOUSE · 38·75 167 BOAT 941
BOAT DK 114·75 CASINGS
EQUIPMENT NUMERAL 19355
ANCHORS AND CABLES.
2 BOWER ANCHORS STOCKLESS
1 " "
1 STREAM " TROTMANS
1 KEDGE "
240 FMS 1⅛ STUD LINK CHAIN CABLE
75 " 4½ FLEXIBLE STEEL WIRE CABLE IN LIEU OF STREAM CHAIN
TOWLINES HAWSERS + WARPS AS PER RULE.
TIE PLATES 12·¾ · 9·¾ YELLOW PINE TO 16·25 ELSEWHERE.
3·25 · 25 · 25 TIE PLATES 9·25
9·3¾ TEAK
4·3 · 30 ON ALTERNATE FRAMES
5·3 · 30
25 · 25 · 25 DOUBLE LUGS
TIE PLATE 12·3
32 · 25 · 25
3·1¾ COPE IRON
WATERWAY 11
TIE PLATE 15·3
BRIDGE DK STRINGER 59·46
POOP + FCLE " 27·30
BRIDGE DK " ANGLE 3½ · 3½ · ·46
POOP " " 3 · 3 · ·50
ANGLE 3·2½ · ·30
DOUBLE LUGS
BEAMS 6½ · 3 · ·40 BULB ANGLES ON ALTERNATE FRAMES.
STRINGER DOUBLED IN WAY OF GANGWAYS 40 · ·36 FOR ½ LENGTH AMIDSHIPS TO 26 · ·30 AT ENDS
3 · 3 · ·34 TO ·30
3½ · 3 · ·30
PLATING ·30 FOR ½ LENGTH
18 · ·40 FOR BRIDGE + FCLE DECKS
16 · ·35 FOR POOP DECK
POOP SIDE PLATING ·30 ·30 FCLE
2½ SR IN WAY OF POOP + FORECASTLE DECKS
AMERICAN ELM 13·12
6 · 4 · ·50
6 · 1 ·30
REVERSE FRAME HEIGHT IN ENGINE. BOILER + BUNKER SPACE.
WOOD DECKS
BOAT DECK YELLOW PINE 4·2½
POOP BRIDGE + FCLE DKS 4·3 YELLOW PINE WHERE EXPOSED 3·4 IN HOUSES
MAIN DECK 3·3¾ IN ROME + AFT + THWARTSHIP PASSAGES IN WAY OF ENGINE CASINGS TEAK
MAIN DECK 3·4 · PITCH PINE IN CATTLE SPACES
3·3 YELLOW PINE IN OTHER PARTS
WHERE LITOSILO NOT FITTED
LOWER DECK 3·3 PITCH PINE IN CATTLE SPACES
3·3 YELLOW PINE IN OTHER PARTS
7·6
SINGLE LUGS
5·3 YELLOW PINE IN HOUSES
BRIDGE DECK
MAIN DECK
FRAMING
FRAMES SPACED 24" APART THROUGHOUT
IN ENGINE + BOILER SPACES + BUNKERS 5·3·¾ ALL TO BRIDGE DK
" " " 3½ · 3 · ·34 " MAIN "
REVERSE " DEPTH OF FRAME GIRDER 5½
REVERSE FRAMES DOUBLED WITH 3½ · 3 · ·34 ANGLE TO TURN OF BILGE IN ENGINE BOILER SPACES + BUNKERS.
FRAMES OUTSIDE ENGINE + BOILER SPACES + BUNKERS 4 · 3 · ·30
ALL TO POOP BRIDGE + FORECASTLE
REVERSE FRAMES OUTSIDE ENGINE + BOILER SPACE + BUNKERS 3·3·26
ALL TO MAIN DK FOR ½ LENGTH + TO MAIN + LOWER DKS
ALTERNATELY OUTSIDE THIS.
BULKHEAD FRAMES THROUGHOUT 4 · 4 · ·36 SINGLE ANGLES
" STIFFENER 4 · 3 · ·30 ANGLE WHERE LOWER DK FITTED SPACED 30" APART
5½ · 5 · ·30 BULB ANGLE · NO " " "
3 · 3 · ·30
6½ · 3 · ·40
4½ · 3 · ·40
2½ · 1⅛ FLAT.
5·3 YELLOW PINE
TIE PLATE 15·3
9 · 3 · ·40 BULB ANGLE ON ALTERNATE FRAMES
TIE PLATE 12·3
9 · 4 · ·40 IN WAY OF WELLS
18 · ·40 FOR BRIDGE + FORECASTLE DECK
5 · ⅞ RIVETS
16 · ·35 FOR POOP DECK 4 · ⅞ RIVETS
3 · 3 · ·30 CHOCKS
ALTERNATE REVERSE FRAME HEIGHT
ALL REVERSE FRAMES TO MAIN DECK FOR ½ LENGTH
18 · ·40 CLEAR OF BOILERS + 1ST CLASS ACCOMMODATION
5 · ⅞ RIVETS
2 PITCH PINE SPARRING
98 · 36 TO 26 · 26
3½ · 3 · ·30
TIE PLATE 9 · ·30
5·3 YELLOW PINE + 5·3 P.P.
CATTLE SPACES LITOSILO IN AFTER CABINS + CREWS SPACES
2¾ · 1⅛ FLAT
LOWER DECK
7·3 · ·40 B.A. ON ALTERNATE FRAMES FOR'D + AFT.
5½ · 3 · ·34 TO ·30 ON EVERY FRAME IN PEAK TANKS
IN WAY OF RECESSED W.T. BULKHEADS
2½ SOLID
16 · ·40
4 · ⅞ RIVETS
6·2 RED OR PITCH PINE
ALTERNATE REVERSE FRAME HEIGHT
2½ PITCH PINE CEILING IN HOLDS UNDER HATCHES 3 AMERICAN ELM.
CONTINUOUS DOUBLE 6½ · 3½ · ·40 DOUBLE ANGLES
FOUNDATION PLATES 12 · ·40 ON EACH SIDE OF CENTRE KEELSON
CENTRE KEELSON 28 · ·45 TO ·9 AT ENDS
FLOORS
21 DEEP · ·40 IN ENGINE ROOM · ·42 IN BOILER ROOM · ·46
" " · ·30 AT ENDS · ·40 IN BUNKERS.
9 · 3 · ·30 9" VERTICAL INTERCOSTAL KEELSONS 3 TO ·30
3 · 3 · ·30
4 HOLE
4 HOLE
4 HOLE
DOUBLE LUGS
4 HOLE
4 HOLE
3½ · 3½ · ·40
FILLER PLATE 4 · 3 · ·30
RUBBING PIECE 8 · 1
⅞ RIVETS IN SEAMS
1 " BUTTS
SINGLE BUTT STRAP 19 · ·88 AMIDSHIP CUT + JOGGLED OVER CENTRE KEEL + GARBOARD STRAKE TREBLE RIVETED
SECTION FOR Q OF BOILER SPACE.
SECTION THRO' BOILER SPACE.
NOTE:- THE HEAVY SCANTLINGS INDICATED FOR ALL STRAKES OF SHELL PLATING ARE FOR ⅛ VESSEL'S LENGTH AMIDSHIPS.

FIG. 2—SCANTLING SECTIONS OF THE CHANNEL STEAMER GREENORE

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is tastefully decorated in enamelled white. The ladies' deck cabin is immediately above and is generally fitted and furnished in a similar manner.

The accommodation for the third-class passengers and cattle dealers is fitted up aft on the lower, main and poop decks, and consists of large open cabins for the third-class and separate rooms for the dealers. A third-class smoking room is provided in the deck house on the poop deck. The sleeping cabins are fitted up with portable berths, wash basins and all the usual fittings.

Special attention has been paid to the ventilation and heating arrangements throughout the ship. The passenger accommodation is provided with a system of trunks and louvres connected to thermo tanks which regulate the temperature as required and are capable of completely changing the air in the passenger compartments, either by supply or exhaust at the rate of six times an hour. Electrically-driven fans are fitted in the trunks leading to all the cattle spaces. The vessel is lighted throughout by electricity.

The Parsons turbine machinery consists of one high-pressure turbine on the center shaft and one low-pressure turbine on each of the wing shafts. The power developed is sufficient to give the vessel a speed of 21 knots. For maneuvering purposes the turbines are so arranged that the center turbine may be used for going ahead while the wing turbins are being operated. The center propeller is right handed and the wing propellers outward turning. The astern turbines are of sufficient power to bring the vessel from full speed ahead to dead stop in three times her own length. All the turbines are easily and quickly accessible for overhauling.

The steam generating plant consists of five Babcock & Wilcox marine-type water-tube boilers of which any four have sufficient capacity to supply steam for the requisite speed under service conditions. The Greenore is the first vessel in the Irish channel to be equipped with water-tube boilers though several of the English channel steamers have boilers of the Babcock & Wilcox type. For the facts incorporated in this article we are indebted to the *Ship Builder*, Newcastle-on-Tyne.

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The Newport News Ship Building & Dry Dock Co. has been awarded the contract for building the battleship Pennsylvania on its bid of $7,260,000, exclusive of armor and armanent. The machinery will be of the Carter turbine type with gearing.

## Some Diesel Engine Data

Some interesting figures are now obtainable in relation to the working of the oil tanker which was built by the New London Ship & Engine Co., New London, Conn., for the Standard Oil Co., equipped with Diesel engines, regarding the completion of the tenth voyage from New York to East Providence. The following figures are furnished by the builders:

Fuel: In tanks on arrival at the Empire yard, Nov. 22, 1912, 990 gallons; total consumption, 392 gallons; in tanks on arrival at Providence, Nov. 23, 598 gallons.

Time: Total time on voyage, 25 hours 45 minutes; total running time, 25 hours 30 minutes; no stoppages at sea.

Revolutions: Average per minute, 320; total number of revolutions, 484,000.

Distance: Total distance run by ship, 168 knots.

Speed: Average speed per hour by ship, 6.7 knots.

Horsepower: Estimated b. h. p., main engine, 300.

Consumption: Total consumption, main engine, 392 gallons; average consumption per b. h. p., hour 4 lb.; no consumption in port.

Pressures: Air injection storage bottle 1,000 lb.; first stage compressor, 100 lb.; scavenge pump, 8.5 lb.; forced lubrication, 25 lb.

Temperature: Circulating discharge, 83; lubricating oil, 66.

Auxiliary set: Running for charging air flasks, six hours, pressure in air flasks before charging, none; pressure in air flasks after charging, 900 lb.

Draught: Leaving port, 12 ft. forward, 14 ft. aft; arriving at unloading port, same draught.

Stores used: Engine oil, 3 gallons; waste, 2 lb.

It will be noticed that the average fuel consumption per brake horespower per hour was 0.4 lb., and that the estimated b. h. p. developed was 300, the engine turning at 320 r. p. m. But on the test-bed trials this engine developed 374 b. h. p. at 300 revolutions for 200 hours, so that it will be seen that fuel consumption may be lower than the figures given, it being roughly 1 gallon per horsepower for 25 hours running. A point of economy in connection with this report which should be carefully noted by shipowners is the sentence "no consumption in port." With a steamship there is always a certain amout of fuel consumption and attendance charges for the main engine boilers when the vessel is being loaded or discharging her cargo. Taking the cost of fuel at 2 cents a gallon, the fuel bill for the 168 knots was only $7.84, and no stand-by charges for the main engine. It would be impossible to find a coal or oil-burning steamship that could have accomplished the voyage at anywhere near this low fuel cost.

It is possible that there is some slight error in the fuel consumption figures given, as, unless the oil used was of a light specific gravity, the consumption would be 0.46 lb. per b. h. p. hour with the engine developing 300 b. h. p., and as it is practically certain that this engine is capable of developing more than this at the speed quoted, the actual consumption as given above would be lower than that of any Diesel engine of this type. On the other hand, it may be that the propeller is not suitable, and that at 320 r. p. m. the engine was not giving its full rated power.

The New London Ship & Engine Co. has established its Pacific coast branch office at 24 Colman Dock, Seattle, under the management of Arthur Fuller, and contemplates building a plant there for the construction of both marine and stationary Diesel oil engines.

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## Crude Oil as Fuel

Crude oil, as fuel for the navy, will be available from the fields of the United States, particularly the California field, for at least a generation, according to a letter written by Secretary Lane of the interior to Secretary Daniels of the navy in response to inquiries by the latter concerning oil resources. Belief was expressed by Secretary Lane that the navy could rely on the reserves already existing for an oil supply for a period greater than the life of any battleship to be constructed within the next decade.

"Twenty years hence," says Secretary Lane, "the price of fuel oil, which then, as now, will be produced chiefly in California, will be much higher than at present, and the production will probably have declined seriously. The failure of the oil supplies of the United States will not take place suddenly. The decline will be gradual and will tend constantly to be checked by rising prices.

"No relief can be expected in the price of fuel oil at Atlantic ports for commercial uses. Relief to the navy from increasing commercial prices can probably be secured only by the development of its own reserves, where it should be possible to produce oils at approximately the present cost of production—50 cents or less per barrel, plus transportation to the point of use."

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The torpedo boat destroyer, Benham, named after Andrew E. K. Benham, retired, was launched from Cramps, Philadelphia, March 22. She is designed for a speed of 29½ knots.

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# Prevention of Accidents

*The Recommendations of the Industrial Committee of the Lake Carriers' Association for the Minimizing of Accidents Aboard Ship*

CLEANING THE DECK

AT THE WHEEL

At the annual meeting of the Lake Carriers' Association, held in Detroit in January last, a resolution was adopted to appoint an industrial committee from among the masters and engineers of the various fleets to consider the general subject of prevention of accident aboard ship.

The first meeting of the committee was held in Cleveland in March, the sessions lasting for 10 days. Capt. Louis W. Stone presided. The personnel of the committee is as follows:

L. W. Stone, chairman, Pickands, Mather & Co.'s fleet.
Wesley C. Brown, G. A. Tomlinson's fleet.
S. C. Allen, Pittsburgh Steamship Co.'s fleet.
George Trimble, Northern Lakes Steamship Co.'s fleet.
T. E. Murray, Cleveland-Cliffs Iron Co.'s fleet.
M. S. Peterson, Boland & Cornelius fleet.
F. C. Pratt, D. Sullivan & Co.'s fleet.
T. H. Sanders, Shenango Steamship Co.'s fleet.
R. J. Lyons, Great Lakes Steamship Co.'s fleet.
R. W. England, W. H. Becker's fleet.
Joseph Lampoh, George Steinbrenner's fleet.
J. L. Weeks, Gilchrist Transportation Co.'s fleet.
Charles A. Benham, Hutchinson & Co.'s fleet.
C. C. Balfour, H. K. Oakes' fleet.
A. W. Armson, Pittsburgh Steamship Co.'s fleet.
James Rossan, W. M. Mills' fleet.
E. T. Everill, Mutual Transit Co.'s fleet.
John Groundwater, M. A. Hanna & Co.'s fleet.
E. W. Doller, Cleveland-Cliffs Iron Co.'s fleet.

In response to the resolution adopted by the Lake Carriers' Association and as to the best method of putting its intent into practice, the committee submitted the following:

*Monthly Meetings*

"In order that systematic effort may be secured in this very important matter we recommend to the Lake Carriers' Association that on all vessels belonging to that association there shall be held at least once a month, or oftener if necessary, a meeting of the licensed officers of each vessel to take up questions of personal injury, safety appliances, and all other matters pertaining to the safe operation and navigation of the steamboat; that at such meetings the captain act as chairman, and the first mate as secretary, and that a record of the meetings be kept and that it be signed by each of the officers attending such meeting."

*Prevention of Accidents*

The general recommendations of the committee for the prevention of accidents are as follows:

1. That the first mate and first assistant engineer be instructed to admonish their crews against the different dangers on shipboard.

2. That no man be allowed to slide down a rope to reach the dock, but that instead he be required to use a rope ladder or folding ladder.

3. That one heavy ladder be put out at each end of the ship when at a dock.

4. That no weak or defective ladders be used at any time.

5. That a bright light be put at the head of each ladder at night.

6. At night when no work is being done only one ladder be left out so watchman can properly attend to it.

7. That good step ladders should be provided on deck at the head of each ladder where practicable.

8. That engineer's gang plank have at least one guard rope or hand rail.

9. That if the dock is unsafe near the approach to the ladder, or if the vessel is lying any distance from the dock, a light shall be placed at the foot of the ladder.

10. That where there are any manholes on deck, or any other place, where men are liable to be injured, that they be protected where deemed necessary by a pipe rail not less than 24 inches high.

11. That while shifting along the docks at night a strong light should be over the side at each end for the benefit of men carrying cables.

12. That steel ladders leading from the manholes on deck to the bottom of the cargo hold should be examined often as they get battered by clam shells and ore.

13. That all rigging and ratlines on all spars shall be examined two or three times a season.

14. That every mooring cable should have a suitable wire hand-hold at the end of the eye as a protection against jammed fingers.

15. That in handling hatches one man should never be allowed to hook the bridle to the hatch. If one man does this work he has to stand on the hatch with the danger of being thrown into the hold. In using two men they can stand between the hatches and one handle each end of the bridle.

16. That no one shall be allowed to walk down the inboard side of the deck when loading or unloading work is going on except members of the crew when absolutely necessary in the discharge of their duties. That warning signs should be placed for this purpose.

17. That no man shall be sent alone to examine ballast tanks, etc.

18. That when men are painting over the side on a staging an attendant should remain above the staging on deck all the time, and that for all stagings there should be used manila rope in good condition of not less than 2½ in.

19. That it should be a practice to have a life preserver on deck when men are painting over the side.

20. That at all times when cable fence has been lowered to work cargo and work has been stopped, that fence should be replaced at once.

21. That slushing wheel chains, painting spars, etc., should not be done by one man unattended.

22. That steering wheel in pilot house should not be turned at a dock unless the engineer is aware that it is to be used.

23. That printed cards, framed, be posted in conspicuous places giving rules for prevention of accidents.

24. That where wooden hatches are used on coal bunkers a support

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for same, of say 2½ in. angle iron, be permanently fixed to the hatch coaming.

25. Where coal bunker hatches on top of boilerhouse are raised above the deck, a 1½-in. removable pipe railing should be placed around same.

26. That all fly wheels and gears on ash elevators should be provided with suitable guards.

27. That where there are steps leading from the spar deck to a firehold that are further than 12 in. from the bulkhead, they should be provided with hand rails on each side of the stairs.

28. That all gratings on top of boilers be provided with hand rails on each side.

29. That all couplings on fan engines be provided with guards.

30. That all stop valves, both on steam and feed lines, be provided with housings over hand wheels; these housings to be plainly marked "DANGER—Man in Boiler" to be used whenever boiler is being cleaned or repaired.

31. That no man be allowed to go into a boiler or into a furnace or backhead of a boiler without he has an attendant with him.

32. That where hand flue-blowers are used the hose and gear for same be examined by one of the engineers before same is used and that all flue-blower hose be provided with extra heavy clamps and that no flue-blower hose be put on a plain smooth pipe but that the pipe be either threaded or corrugated.

33. That all boats which have shelf pieces in the bunkers where the coal gets below said shelf pieces that the engineers see that coal is cleaned off same by the coal-passers to prevent accidents from the coal falling on the men.

34. That not less than 2½-in. line be used for hoisting flue caps and painting smoke stacks and that whenever a man is hoisted on same the gear and line be examined thoroughly by one of the engineers.

35. That a 1½-in. angle iron be placed at the edge of the grating around the engine to prevent anything from rolling off and hurting anyone below.

36. That all cross gratings in engine framing be provided with a 1½-in. angle iron on both sides.

37. That where arm to reverse engine extends above the working floor a guard at least 6 in. high be placed about same.

38. That a suitable guard or rail be placed both forward and aft the engine on the lower floor to prevent men from being injured by machinery.

39. That all couplings on main engine shaft wherever exposed be covered by a good and sufficient shield.

40. That wherever air pump is open for examination the throttle be securely fastened or locked.

41. That where any machinery or parts of machinery are hoisted and it is necessary to place men underneath same it be securely blocked, and that hoisting tackle be never depended upon.

42. That all dope cups on eccentrics be extended by piping a suitable distance up the eccentric rod so a man can screw same down without danger to his hands.

43. That a suitable guard or double rail be placed around all fly wheels on electric light engines.

44. That all water gage glasses be protected by a screen full length of the glass.

45. Whenever men are put up on smoke stack to paint same, precaution be taken that boilers do not blow off and that steam valve to whistle be shut off also.

46. That all firehold doors be provided with bale hand hold on the inside in addition to the latch.

47. That all auxiliary machinery on board the ship with exposed cog gear be protected by guards.

48. That this committee recognizes that there is an element of danger in leaving the hatch standards out when hatches are on and the vessel is not working cargo, under which circumstances these rests should be put in place.

49. That a piece of wire be rove off for the purpose of pulling a gantline through the sheave and that every man sent aloft shall be sent on this gantline rather than up the rigging. This is to apply to the after spar only.

50. That all vessels in the Lake Carriers' Association be provided with a medicine chest and book of instructions furnished the master for his use and that the medicine chest be available for the use of the crew at all times, also that the Wilson stretcher, which is made especially for taking men out of holds, be furnished each vessel.

51. That all loading ore docks have a man stationed at the outer end for taking lines from the boats making these docks, so as to assist in elimination of danger in getting men over the side of the vessel for the purpose of handling lines.

52. That all escape pipes leading from safety valves should be at least 7 ft. above the deck.

53. That all hot water or steam hose connections in engine room and boiler house should be connected vertically with the pipe instead of horizontally.

54. That when blowing off purifiers or blowing off boilers in port there shall be a man stationed at the gangway before the valve is opened to see that no one is in range with the blow off pipe.

55. That a steamer's engine shall never be moved in port without the engineer's department notifying the officer of the deck.

56. That the "pig-tail hook" or a shackle be adopted for all hanging ore sections when not in use.

57. That we heartily endorse the Lake Carriers' Association rules and regulations with regard to boat drills, and also recommend that two tubs for each lifeboat be furnished to put the boat falls in to prevent falls from fouling when boat is being lowered.

58. That on all boats that have chain hatch gear that has been discarded in favor of cables for removing hatches, hooks with a handle or bale be provided.

59. That all vessels not already equipped shall have a 1½-in. pipe rail forward of the forward hatch and one aft of the after hatch.

60. That each ship be equipped with signs reading "DANGER! You are forbidden to walk on this side of the ship", to be located just forward of the forward hatch and just aft of the aft hatch on the dock side.

61. That sounding pipe be installed in the forepeak.

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The bureau of construction and repair of the navy department are now designing the new vessels recently authorized by congress. Namely, one battleship, six torpedo boat destroyers, four submarines, one transport and one supply ship. It is understood that the battleship will be practically a duplicate of the Pennsylvania. The transport will be the first vessel of its kind constructed solely for the navy, all the other transports having been purchased.

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E. M. Cook, who for the past ten years has devoted his time to the design and manufacture of metallic packing, has recently brought out a new packing known as Simplex. The Simplex packing ring has few parts and no complications and is being manufactured by the Simplex Manufacturing Co., Oberlin, O.

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The steamer Heighington, of the Munson line, recently entered the harbor of Plymouth, Mass., with a cargo of sisal fiber for the Plymouth Cordage Co., being the first steamer flying a foreign flag to enter the port. The channel has been recently dredged to a depth of 18 ft.

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## New Floating Dry Dock at Seattle

The new floating dry dock of the Seattle Construction & Dry Dock Co., Seattle, Wash., has been put into commission. The dock is of the Rennie type and is of the following dimensions:

Length on keel blocks, 468 ft.; width between walls, 90 ft.; height of walls above deck of pontoons, 35 ft.; lifting power, 12,000 tons.

The six pontoons of which the dock is composed are identical in size and construction. Each pontoon contains 18 trusses on 4-ft. centers; the trusses are formed of arch member on top and longitudinal timber on the bottom, these two connected by tie rods and by struts and blocking between members.

The deck of the pontoons upon which the walls are fitted is open to the walls, giving free communication for water between the walls and pontoons.

*Heavy Timbers*

The center line bulkhead of the pontoons upon which the keel blocks rest, and which takes the weight of the vessel, is built up of heavy timbers and is watertight. On each side of the center are three bulkheads, one under the inboard side of the tower and two under the bilge blocks.

The connection between the steel towers and pontoons is made by heavy straps which are bolted to the sides of the towers and to heavy steel straps on the side of the pontoons. The connection on the inboard side of the towers is made in the same way.

The framing of the steel towers is cross-braced and stiffened by diagonals. The towers are divided into six watertight compartments by bulkheads.

A watertight steel flat extends fore and aft 9 ft. below top of towers. This serves as a machinery deck where all the pump and capstan motors are located.

Any pontoon may be detached and self-docked at any time, thus making every part of the whole structure accessible for painting and repairing.

Keel blocks are 4 ft. centers and are built up of 12-in. by 12-in. timbers. The two bottom timbers are of hollow wood and tapered so that they can be driven out and the blocking removed under the keel of a vessel while on the dock. Bilge blocks are built up of fir timbers and so arranged that they can easily be altered to suit the shape of different vessels. The bilge blocks are pulled into position and removed by steel wire ropes running to hand winches on top of towers.

When a vessel is in the dock, bow and stern lines are passed to the capstans on the towers and the vessel placed in position so that the keel is on the center line of the keel blocks. This position is indicated by centering chains extending across from tower to tower at each end of the vessel and having a plumb bob suspended at the center link.

The pumping plant consists essentially of six 18-in. vertical, motor-driven, centrifugal pumps, having a combined capacity sufficient to dock a 12,000-ton vessel in two hours.

Pumps are of the Kingsford Foundry & Machine Works, Oswego, N. Y., make. They are of the vertical, submerged volute type, each having a capacity of at least 500,000 gallons of water per hour against a static head varying from 4½ in. to 18 ft. 5 in.

Each pump is driven by a 60 H. P., 390 R. P. M., three-phase, 60-cycle, 440-volt, constant speed vertical type induction motor of Westinghouse manufacture.

All the pumps, and the operating house from which the entire dock is controlled, are situated on one side of the dock, the operating house being located at one end of the tower on the upper or running deck.

One pump is located in each pontoon near the bottom of the pontoon and is mounted on a cast iron pedestal.

The suction splits into two 12-in. branches, each one of which is provided with a quick-opening gate valve. Each branch serves one of the two watertight compartments of the pontoon.

*Control of Valves*

The twelve 12-in. gate valves are mechanically controlled, through rods and countershafts, by hand levers arranged in the operating house.

The motors are located on the machinery flat in the tower, each being arranged directly over its respective pump, to which it is connected by a vertical shaft. A flexible coupling is fitted above each pump and for carrying the weight of shafting, etc., a suitable thrust washer and collar is provided in the pump.

Each motor is independently controlled from the operating house by an oil immersed auto starter with automatic overload and no voltage release attachments.

For lowering the dock water is admitted through the pumps and 12-in. lines.

The athwartship trim of the dock can at once be read by a pendulum inclinometer fitted on the wall of the operating house.

For the fore and aft trim, a horizontal pointer, fitted with a lever, is used, a graduated scale and adjustment being provided for one end.

The head of water in each compartment of the dock is recorded by an altitude gage located in the operator's house. From this gage a small pipe leads to a suitable place in the respective compartment, and terminates in an inverted cup. A compressed air tank is provided, with a connection to each indicator pipe, so that all water can be forced out of the pipe, thus insuring an accurate reading of the head of water carried by the air pressure.

For warping ships into position in the dock, the running deck of each tower is provided with eight bollards and three capstans, the capstans being located one at each end of tower and one in center.

*Auxiliary Machinery*

These capstans are each driven by a 25 H. P., 440-volt, A. C. 720 R. P. M. motor. The motors are located on the machinery deck below, each motor driving its capstan through gearing and a worm and wheel. The worm wheel is fitted on the lower end of the vertical shaft passing up through the running deck and fitted into the capstan at its upper end.

The capstans are of cast iron, and are designed so that they can be released from the vertical shaft for hand turning, six sockets being provided in each capstan.

A cast iron base provided with groove and ball bearings carries the weight of capstan and shafting.

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The directors of the Lake Carriers Association recently met in Cleveland and adopted a resolution that the three-watch system for firemen be extended to all vessels of the association. This system is now in vogue on some of the steamers.

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John D. Gilchrist, who was recently appointed manager of the boats remaining in the Gilchrist fleet, and Harry C. Doville, who was dispatcher for the Gilchrist Transportation Co., have opened offices at No. 854-856 Rockefeller building, Cleveland, O.

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The ore and coal handlers on the docks at Lake Erie ports will get an advance in wages when the shipping season opens. No demands were made by the men, the advance being entirely spontaneous on the part of the dock managers.

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# THE MARINE REVIEW

DEVOTED TO MARINE ENGINEERING, SHIP BUILDING AND ALLIED INDUSTRIES

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April, 1913

## *Our Merchant Marine*

One of the most earnest advocates of the upbuilding of an American merchant marine is Lewis Nixon, who has been all his life identified with affairs maritime. A recent article of his in the New York *Sun* is fairly bristling with epigram and is full of argument. Consider this:

"The strategy of trade is as important as the strategy of war, and enlightened patriotism requires that we should safeguard our country against any and all possible adverse combinations. We are faced upon the oceans by a monopoly of shipbuilding and of the arts and accessories of navigation, together with inordinate naval power. Such a condition threatening our prosperity should arouse us to immediate action.

"There is no way in which we can resume our destined place upon the ocean without displeasing some one, and the greater the benefits a country receives from our suspension of our constitutional rights to regulate commerce the greater its resentment will be against any and all steps taken to resume such regulation. We cannot reap, without sowing. Nations concede no rights that are not asserted."

He is heartily in favor of a remission of tolls to American ships passing through the Panama canal, saying:

"Even the little encouragement of the toll remission on coasting vessels has filled our shipyards as they have not been for years. I have heard men, encouraged by the sophistical flow of words, tell that the remission of tolls will not benefit the people, yet we hear the president of the American-Hawaiian Steamship Company among others here in New York tell us that he is quoting rates via the canal plus toll charges if exacted. Volumes could not answer this argument more conclusively.

"We need most remission of tolls in the foreign trade. This is because it will quickly rehabilitate our marine in such trade. Of course our people will have foreign influences telling them that this is not so, that these same influences prevailed on the weak kneed economist to put ships on the free list, knowing that the only way in which this could benefit our marine would be at the cost of the destruction of our shipbuilding industry.

"Where are the foreign ships that we were assured would rush to our flag? Where are they? The very men who advocated this policy knew it was a dead letter or else were too ignorant to know anything. We may eventually get the fruit carrying fleet, but that is about all of importance."

He says that we are spending more than $300,000,000 a year for ocean transportation. In 1907 we exported $1,800,000,000 of goods and imported $1,200,000,000, so that other things being equal a balance of trade statement as usually given should indicate a credit abroad of $600,000,000; yet that year every time a few millions in gold left us on sailing days a shiver ran through the commercial districts, so there must be an unaccounted for drain. Mr. Nixon adds:

"This is the vast sum paid for ocean transportation and so long as this is not kept at home we must dig and delve and sweat to produce an excess of exports over imports to pay for it, for commerce includes transportation as well as trade and barter and a balance of trade statement as usually given is as misleading as would be that of a merchant who did not include his delivery charges. We must add our transportation charges to our imports, as they are the price paid for the use of foreign tools, ships being the tools of commerce just as much as if such product were a bolt of silk or a case of wine.

"Certainly if we carry our exports in our own ships we increase our credit abroad, where we wish it increased; while if we bring our exports in our own vessels we reduce our debt at home, where we want it reduced. While our exports may be carried very well by foreign vessels, it is certain that with all trade connections in foreign hands they can largely control the disposition and the prices. English freight charges, for example, range the highest, while they get our goods at the lowest rates. Our wheat is sometimes poured into Liverpool and Bristol under such conditions and so sags the market that the price of wheat is lowered on the most distant farm.

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"This is no new doctrine; it is simply common sense and well understood by the statesmen controlling the destinies of other nations who do not believe that the way to increase the average weight of a herd is to kill its heaviest members.

"Now we know that both France and England have adverse balances of trade; that is, imports in excess of exports. In the average year of 1896 that of France was $63,883,000. Against this the income from shipping was about $60,000,000. The same year the British adverse balance was $707,680,000, while the credit from its carrying trade was about $641,250,000, so we see that with either but little additional credit was needed that year from sources other than from shipping to balance favorably the commerce of these two great nations."

No one can fail to note the advantages of the development of ship building to a nation, stimulating as it does every calling, profession and trade. If we revive our marine and build our own vessels we shall keep at home hundreds of millions of dollars and give employments to thousands of men. Today the coasting trade keeps alive our ship building. There is, however, a broad distinction between coastwise and foreign trade. Shipping in our domestic trade is a valuable industry deserving of development and preference, but on the other hand shipping in the foreign trade is not only an industry worthy of national regard the same as the coasting business, but, as I have explained, it offers a ready and commanding means of regulating the balance of commerce abroad; hence in the sum total of our national prosperity it is of vital importance.

Mr. Nixon urges the repeal of the rider in the Panama canal act permitting the importation of ships' material free, saying that it has proved useless but is nevertheless a menace to our ship building industry if our merchant shipping develops.

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## *The Hardy Bill*

The Hardy bill, which was passed in the closing days of the last session of congress, was intended by its framers to deal only with deep sea conditions of sailing, it being generally recognized that the conditions which it sought to remedy did not obtain on the lakes at all. The framers were definite in their declaration that it did not apply to the lakes, but an examination of the exact language of the third section of the act leaves vessel owners in some doubt as to whether that particular section does not apply. The ambiguity arises from the fact that while the second section specifies ocean and coastwise seagoing merchant vessels, the third section leaves out the word "seagoing", making it read "ocean and coastwise merchant vessels". The probability is that the framers intended the meaning of the second paragraph to apply also to the third and did not think the repetition of the word "seagoing" necessary; but its absence has nevertheless given rise to doubt, though the practical application of the requirements of the paragraph to conditions existing in the bulk and package freight trades of the lakes would be absurd and would work more harm than good.

The Lake Carriers' Association, through its president, has sent out to the members of the association the following circular regarding the bill:

"The Hardy bill was pending when a considerable number of managers and masters appeared before the senate committee on commerce and urged against its application to the great lakes. The original idea seemed to have been that it should not, but the language employed made this doubtful, and it was the hope that the reasons and arguments presented would be convincing and the delegation left Washington with strong reason for believing that it would be made non-applicable to the lakes in definite terms.

"In the throes of the last two or three days of the session, the bill was reported out and passed in the form hereto attached.

"In reference to the first section, there is some change in the phraseology of previous laws, but our counsel reads the law to mean that there shall be no penalty on the owner where the master in good faith proceeds with less than the complement prescribed in the certificate where he is deprived of the services by desertion or casualty and by proper effort is unable to procure others and believes he may complete his trip with the lesser number. It is important that the master observe the requirement to make report within 12 hours of arrival at destination. This provision has been in the law for several years and it may be expected that masters are familiar with the requirements and will not neglect performance of this important duty.

"The second section relating to the number of mates to be carried clearly has no application to the great lakes.

"There will be a dispute whether the third section does or does not apply to the great lakes, but it is the opinion of our counsel that the provision requiring for an officer six hours off duty within 12 hours preceding the time of sailing would not apply to the master who is the vice principal of the owner and stands in his shoes and is responsible for carrying out the provision in reference to the other officers of the ship.

"Also the opinion is that where a steamer is in port with her engines idle it would not be necessary to have a licensed officer at all times in charge. In other words, with two licensed engineers to be in charge of the engine at all times while operating, she might lie idle with steam down or simply operate deck engines and pumps without licensed officer in charge.

"It is hoped that this will be the interpretation by the department, should the department go so far as to rule that any part of the law applies on the great lakes."

The subject will not be permitted to go by default. The department of commerce and labor will undoubtedly be called upon for a ruling and if it should decide that the measure is applicable to the lakes, which is unlikely, the subject will be taken up with congress for definite amendment.

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# Heavy Duty Gasoline Engines

***The United States is Making Striking Inroads Into the Foreign Market by the Exportation of Gasoline Engines for Use in Commercial Boats.***

***The Internal Combustion Engine as Applied to Small Passenger Boats, Cargo Carriers and Ferries. Its Advantages Over Steam as a Prime Mover.***

THE LIGHTHOUSE TENDER WOODBINE EQUIPPED WITH CORLISS KEROSENE ENGINE

AS a striking index to the remarkable development of the gasoline engine in the United States, it is noted that the exports of this type of internal combustion engine to South America alone increased from $332,760 in 1911 to $1,642,447 in 1912. Comment has also been made by English houses that orders for machinery of this character are finding their way into American hands freely and that they are making serious inroads into the British market in the Far East. As an instance of this notation is made of two 100-H. P. Speedway marine engines, built by the Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, New York, which were installed in two hulls constructed by W. S. Bailey & Co. at Kowloon, Hong Kong, for the Manila government. The voyage of 636 miles from Kowloon to Manila was made without a stop, the boats averaging about 8½ knots.

Extremely satisfactory has been the performance of the Speedway gasoline working boat, Croton, which was built in 1910 by the Gas Engine & Power Co. for the Department of Water Supply, Gas and Electricity, Bureau of Water Register, New York. The Croton is 50 ft. over all, 10 ft. 6 in. beam and 3 ft. 6 in. draught, with an average speed of 12 miles an hour. She is employed in inspection service all the year round in the waters of New York harbor, East River to City Island, Hudson River and to Tottenville, S. I. The Croton has the proved reliability of a steam vessel with the added advantage of being ready at a moment's notice without the necessity of keeping up steam at all hours. The Croton's log book shows that during the past three years she has achieved a mileage of 38,000 miles, equal to a distance of one and one-half times around the world. This mileage was taken from straightaway runs, not including stops for inspection. Frequent stops are trying on a motor, but notwithstanding the great mileage recent inspection of the motor shows little wear, and it is in good condition for many more years of hard service.

The Croton is equipped with a four-cylinder engine, 6½ in. bore by 8 in. stroke, developing from 50 to 60 H. P., equipped with mechanical force feed oiler, Bosch dual ignition and Bosch low tension magneto.

The accompanying photograph shows the general design of the Croton. Under the forward deck stowage space is arranged for, steel bulkheads separating it from the pilot house. The engine room is located aft of the pilot house and is also separated by a steel bulkhead. The cabin space aft, which is entered from the cockpit aft, is also shut off from the engine room by a solid steel bulkhead.

The Woodbine, equipped with Corliss kerosene engine, was designed by the draughting force of the Bureau of Lighthouses and was originally intended to be a steamer. The contract was awarded to the Waters-Colver Co., of Staten Island, N. Y., but before completion the vessel was taken over by the government. The hull was towed to Baltimore and is being completed at the local headquarters of the United States Lighthouse Engineers under the direction of the local office. When the Woodbine was taken to Baltimore, it was decided to change the motive power from steam to liquid fuel, and the engine selected was a 125-H. P., three-cylinder, four-cycle Corliss,

THE CROTON, A SPEEDWAY GASOLINE WORKING BOAT

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with cylinders 13½ in. by 15½ in., and weighing 15,000 pounds. This engine is the product of the Corliss Engine Co., of San Francisco, and is a kerosene burner. Incidently, this is the first engine of this type to be placed in service in Atlantic coast waters. The Corliss was adopted upon recommendation of Melbourne Crisp, assistant superintendent of the Lighthouse Service, who was formerly attached to the Pacific coast and who was much pleased with the service of engines of that type in hundreds of craft in those waters.

The Woodbine will work on the part contains the cargo hold, a space about 9 x 20 ft. Then comes the crew's quarters. Aft of this is the engine space. The officers' quarters are aft.

The Fulton Mfg. Co., Erie, Pa., make an engine 5-6-H. P. and 7½-9-H. P., single cylinder, which has proved quite popular for fishing boats and yawl boats. They also make a type 10-12-H. P. and 15-18-H. P., for small boats suitable for passenger, mail and freight service in shallow waters.

The group of photographs accompanying this article shows the type of with sponges. These boats are about 28 ft. long by 9 ft. beam and are usually equipped with a 7½-H. P. engine.

The Lorena T is a typical North Carolina fishing boat, used in Pamlico Sound and the Neuse River. The Lorena T is equipped with a 10-H. P., self-sparking Fulton engine, and is 30 ft. long by 9 ft. beam. Her cruising area averages 40 running miles per day.

The Daisy is a tow boat, owned by C. C. Stewart, New Bern, N. C., and is used for towing schooners and flats about the harbor. The Daisy has been in continuous service for nearly three

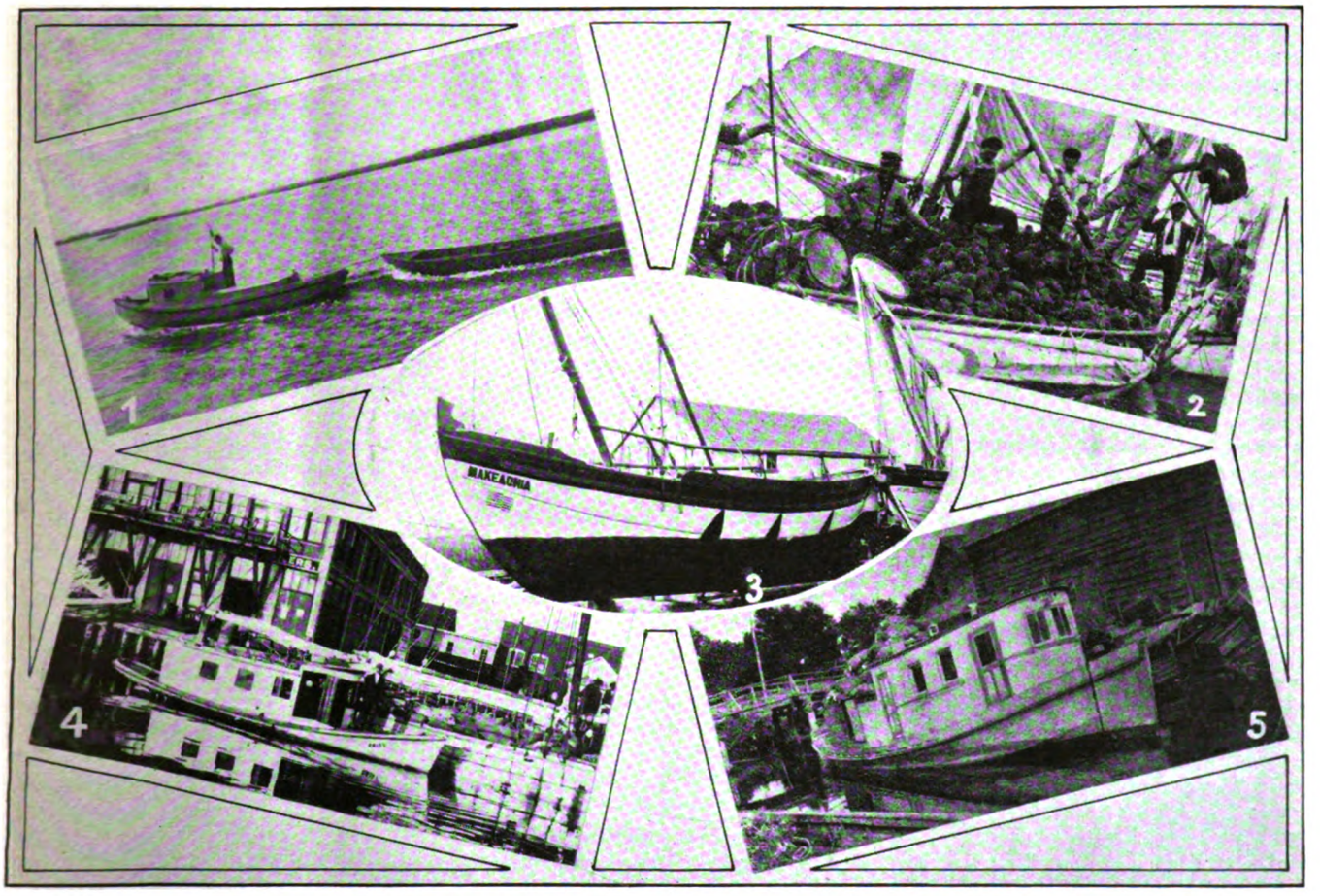


FIG. 1—LORENA T, A TYPICAL NORTH CAROLINA FISHING BOAT. FIG. 2—SPONGE FISHING BOAT OF TARPON SPRINGS, FLA., WITH LOAD OF SPONGES. FIG. 3—THE MAKEADNIA, A TYPICAL GREEK FISHING BOAT. FIG. 4—THE DAISY, A NORTH CAROLINA TOW BOAT. FIG. 5—THE HYDE EQUIPPED WITH TWO SELF-SPARKING FULTON ENGINES

Chesapeake Bay, in the Fifth District. She is a sturdy little vessel, 94½ ft. over all, 15½ ft. beam, 7 ft. depth and will draw 5 ft. loaded. Her light draught will enable her to go anywhere on the bay and to reach many beacons direct. Many of these beacons have been beyond reach of the steam tenders and supplies had to be transferred in row boats.

The Woodbine is to be equipped with a mast and derrick, the latter to be operated by a hoisting machine that will be geared to the main engine.

The vessel is to be comfortably furnished for her crew. The forward boat in which the Fulton engine is employed. The Hyde, a 52-ft. x 15-ft. freight boat, equipped with two 15-H. P., self-sparking Fulton engines, runs between Washington, N. C., and Wysocking, Hyde County, N. C., a distance of 75 miles. The Hyde maintains a schedule of nine miles per hour on this run and makes from two to three trips a week.

The Fulton engine has also proved a popular type in the sponge industry in the Gulf of Mexico. The Makeadnia is a typical Greek sponge fishing boat, operating from Tarpon Springs, Fla. One of the views shows a boat loaded

years without trouble of any kind.

The Fulton engine is a three-port, two-cycle engine of medium weight and speed. The design admits of extreme compactness and simplicity along with large crank shafts and large bearings without the weight of the motor being excessive. On account of its self-sparking waterproof ignition system, it is especially adapted to open boats of all kinds.

The Fulton company has recently also developed a self-sparking kerosene engine to meet the big advance in the price of gasoline. The engine starts up on gasoline and as soon as it is hot

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is switched over to kerosene. Two separate carburetors are used, one for gasoline and the other for kerosene. The exhaust heat is used for vaporizing the kerosene, the kerosene being drawn in around the exhaust chamber and into the same carburetor pipe as the gasoline vapor. Water is introduced into the kerosene vapor to increase the smooth running qualities of the engine on kerosene and to prevent carbon deposits from forming on the piston and cylinder.

*Wolverine Engine*

The harbor of Erie is one of the finest on Lake Erie and gasoline boats with Fulton engines are quite popular there. One of them, the Irene Beck, carrying 50 passengers, operated continuously during the season of 1912, running from 5 to 15 hours daily without a hitch.

The Wolverine Motor Works, Inc., Bridgeport, Conn., have had unusual success with their line of heavy duty marine engines in sizes of 12 to 100 H. P. They have practically sent them all over the world. For instance, the Gilda, 25 ft. long and 8 ft. beam, equipped with a 5-H. P. Wolverine engine, is operating in Spanish Honduras, where she is doing service in a variety of ways. Recently she towed 53 mahogany logs, an aggregate of 50,000 ft. of lumber, a distance of three miles in 45 minutes.

The St. Charles, a French fishing boat, operating from La Rochelle, France, is equipped with a 36-H. P. Wolverine engine and is frequently employed to tow other vessels out to the fishing grounds. The Wolverine engines are of the four-cycle type.

The inland waterways of Europe, pierced as the country is with innumerable canals, afford a great field for the gasoline engine, and the Wolverine is frequently to be encountered doing the work that was formerly done either by men or horses in towing barges along the canals.

The light draught freighter, St. Lucie, of Palatka, Fla., is equipped with a 75-H. P. Wolverine engine, operating in connection with a suction gas producer. The St. Lucie was formerly a stern wheel proposition, but not being satisfactory, was remodeled into a vessel of the tunnel type. She is now operating very successfully.

The schooner Dr. Lykes, owned by the Crosland Steamship Co., operating between Miami and Key West, Fla., 110 ft. long and 22 ft. beam, is also equipped with a 75-H. P. Wolverine engine and suction gas producer. This engine in combination with a gas producer is found on a number of vessels on European rivers.

The Wolverine engine has proved quite successful as an auxiliary. For instance, the schooner George B. Cluett took a load of fish from Labrador to Rio de Janeiro and returned with a ship load of cocoanuts to Philadelphia in very good time. The Wolverine engine has also proved quite popular in the fruit business in Central and South America, the company having recently shipped two 50-H. P. engines to Mexico for use in that trade. The fact that the order for the two engines came from the same firm that formerly purchased a 36-H. P. Wolverine engine, requires no comment.

The company recently shipped a carload of engines to its representative at Vancouver, B. C.

Fairbanks, Morse & Co., Chicago, are making a two-cycle, three-port gasoline marine engine in three types. These types differ only in the method of construction, the principle of operation being the same in each. The type E engine is made with a solid cylinder head in two sizes only. The type G engine is made with a removable cylinder head in four sizes. The latest type, K, is built in two sizes, and is made with removable cylinder head and cylinders cast separately from the crank case. The company holds the two-cycle type to be the simplest so far developed in gas engine practice. Having an impulse at every revolution, coupled with the fact that there are no valves or complicating mechanism, makes it preferable of the four-cycle type for some purposes. The company has adopted the three-port type, believing that the three-port engine, when properly designed, is more economic and will run faster and develop more power than the type which has a check valve in the base. This company, one of the oldest in the United States, furnishes a guarantee with every engine that it puts out.

*The Sterling Engine*

The smallest type of engine built by the Sterling Engine Co., Buffalo, N. Y., is a two-cylinder, long-stroke, slow-speed design of great flexibility and built especially for heavy and continuous work, ranging from 8-10 H. P. to 12-15 H. P. The engines have a range of from 200 to 600 R. P. M., and develop their rated horsepower at from 400 to 500 R. P. M. The oiling system is of the mechanically operated force feed type. The tubes lead to each cylinder and to all main bearings. They are very suitable for fishing boats, auxiliaries, family launches and cruisers. A great many of them have been installed in tenders attached to warships, notably the cruisers Birmingham and Salem.

The company also builds an eight-cylinder, 100-H. P., heavy duty engine for commercial purposes. The company believes that eight cylinders of medium bore produce a smoother running machine and with less vibration than an engine of perhaps equal power, but with fewer cylinders of large piston diameter. This type of engine is installed in the steel cruiser, Elmasada II, owned by Daniel Good, of Buffalo, N. Y., and they are also installed in a number of seagoing cruising yachts.

The Clifton Motor Works, 229-231 East Clifton avenue, Cincinnati, O., are putting out an engine of a medium weight type, suitable for heavy duty service. The chief feature of this engine is the accessibility of its working parts. The valves, valve lifters, cams and cam shafts may be removed without having to take down a number of other pieces. The pistons may be removed without taking off a cylinder head or removing a cylinder head. This engine has enjoyed quite an extensive sale in such remote countries as New Zealand and South Australia.

The Gray Motor Co., Detroit, Mich., manufacture a 6-H. P. Model R gasoline engine, which is used on many fishing boats, especially in the waters of Prince Edward Island, where the fishing industry is very extensive and where a reliable and rugged engine is essential. Their 24-H. P., double-cylinder engine has proved itself to be exceptionally good in commercial boats of the paddle wheel type. This type of engine of but 36 H. P. operates a large paddle wheel ferry steamer at Niobrara, Nebraska, for the Niobrara Ferry Co.

The Anderson Engine Co., 140 South Dearborn street, Chicago, Ill., have installed their gasoline engines in a number of work boats in size from 50 H. P. to 100 H. P. Among the firms using this type of engine for marine service are, G. W. Harper & Son, Whitestone, Va.; Capt. W. J. Thornton, St. Petersburg, Fla.; J. E. Lindsey, Gananoque, Ont.; Charles M. Solheim, Great Kills, S. I., and Fred Schram, 313 Maple street, Milwaukee, Wis.

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The engineer-in-chief of the United States navy has made plans to expend not more than $250,000 during the next year for the development of a type of heavy oil engine. It is proposed to purchase plans abroad and build the engine at the New York navy yard for installation in the new collier Maumee.

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C. P. Steinmetz, of the General Electric Co., Schenectady, N. Y., was awarded the Elliott Cresson gold medal through the Philadelphia Franklin Institute for the successful application of analytical method to the solution of numerous problems in electrical engineering.

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# Coaling Plant at Panama

## *The Government Will Establish Capacious Plants at Cristobal and Balboa*

THE Isthmian Canal Commission is now evolving its general plans for coaling facilities in the canal zone. It is at present engaged in the work of constructing a temporary coaling dock at Balboa on the Pacific side as the excavation work at the Balboa terminal will shortly make the use of the present dock impossible.

*Storing Coal Under Water.*

It is planned by the commission to have a coal storage basin at Cristobal on the Atlantic side with a capacity of 290,000 tons and one at Balboa with a capacity of 160,000 tons. In each place the storage will be within a large basin made of reinforced concrete in which approximately half the coal will be stored under water for use in time of war and the other half above water for commercial use. It is also the intention of the commission to lease part of the storage basin to such private coaling companies as may wish to maintain their own coal stores; but in all such cases, the handling will be done at the government plant.

The specifications are not hard and fast, but merely establish certain general methods and standards, leaving it to manufacturers to devise suitable machines. One of the limiting conditions is that the government shall build the substructure or storage bin and place upon the walls such tracks as cranes and other movable machines may require. This substructure will cost more than the coal handling plant. The details will not be decided upon until the bids for the handling plant have been canvassed, because each plan will require its own special substructure, and one of the points considered in awarding the contract will be the cost of the substructure required under each plan.

*The Handling System*

The specifications call for a handling system which will include the transfer from ship to storage and from storage into lighters or colliers. The Cristobal plant must be capable of unloading 1,000 tons and loading 2,000 tons of coal each hour, and the Balboa plant 500 or 1,000 tons.

Vesels requiring bunker coal will not be permitted to go alongside the wharves, but will be coaled from barges.

*Location of Coaling Plant*

The coaling plant at the Atlantic entrance will be situated on the north end of the island formed by the old French canal, the American canal, and the Mindi river. It will be reached from the mainland by means of a bridge to be built by the Panama railroad over the French canal south of the dry dock shops. The storage basin will be opposite Dock No. 13 at Mount Hope, and it will be 1,000 ft. long and 250 ft. wide. The bottom of the basin will be 19 ft. below mean tide, and the elevation of the decks of the wharves 10 ft. above mean tide. There will be 41 ft. depth of water alongside the wharves. The wharves will be founded upon steel cylinders filled with reinforced concrete resting upon hard rock. The maximum tidal oscillation in Limon Bay is 2.65 ft.

For this type of storage basin, at least two layouts of coaling plant are feasible; the first being that in which the loading and unloading wharves occupy opposite sides of the basin

PANAMA CITY AS SEEN FROM THE TOP OF ANCON HILL

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parallel with one another, with the coal piles between them, and the second that in which the unloading wharf will be at right angles to the loading wharf. The normal capacity will be 240,000 tons, capable of increase to 290,000 tons by piling coal to 10 ft. additional height.

*Pacific Entrance*

The coaling plant at the Pacific entrance will be on on the quay wall south of the entrance to the large dry dock. The size of the basin will be 500 ft. long and 250 ft. wide for one design of plant, and the same length and 340 ft. wide for a second design. The extreme tidal difference here is 21.8 ft. As at the Atlantic entrance, the loading wharf will be founded upon concrete cylinders resting upon hard rock; the unloading wharf will be gravity section concrete wall resting on rock. The normal capacity of the Balboa plant will be 135,000 tons, capable of increase to 160,000 tons, by piling coal 10 ft. above normal height.

The layout is somewhat different from that at the Atlantic entrance, although the methods of handling the coal will be similar. The unloading wharf will be situated at the outer end of the dry dock slip, while the line of the loading wharf makes an angle of about 45 degrees with that of the unloading wharf, running out toward the canal prism from the end of the unloading wharf.

In the first plan a basin 500 ft. long and 250 ft. wide is provided for, with bottom at 18 ft. below mean tide, and top of wharf at 16½ ft. above mean tide. The capacity of this plant must be not less than 500 tons of coal an hour to be unloaded and 1,000 tons per hour to be loaded aboard colliers or barges. Two unloaders will be required with conveyors, and two single stocking reclaiming bridges. Two reloaders will also be required. The operation of this plant is essentially the same as that for the Atlantic entrance.

An alternate plan for the Balboa plant provides for the same location of the wharves but for a basin 500 ft. long and 340 ft. wide. The unloaders are the same as in other plans, but instead of dumping into conveyors they will discharge by means of the cantilever end directly into the basin, and large cantilever cranes will then pick up the coal and deposit it at any desired points in the storage basin. For reclaiming, these same cranes will pick up the coal and trolley it into their towers where it will be dumped into cars or other conveyers, whence it will be carried away from the basin, along the front of the reloading wharf to the reloaders.

The purpose of this second plan is to make use of four berm cranes now used in the placing of concrete at Miraflores locks, and thus save the expense of the stocking and reclaiming bridges. Whether they will be used depends upon the cost and general desirability of this plant compared with one having entirely new handling machinery.

## Work at Naval Gun Factory

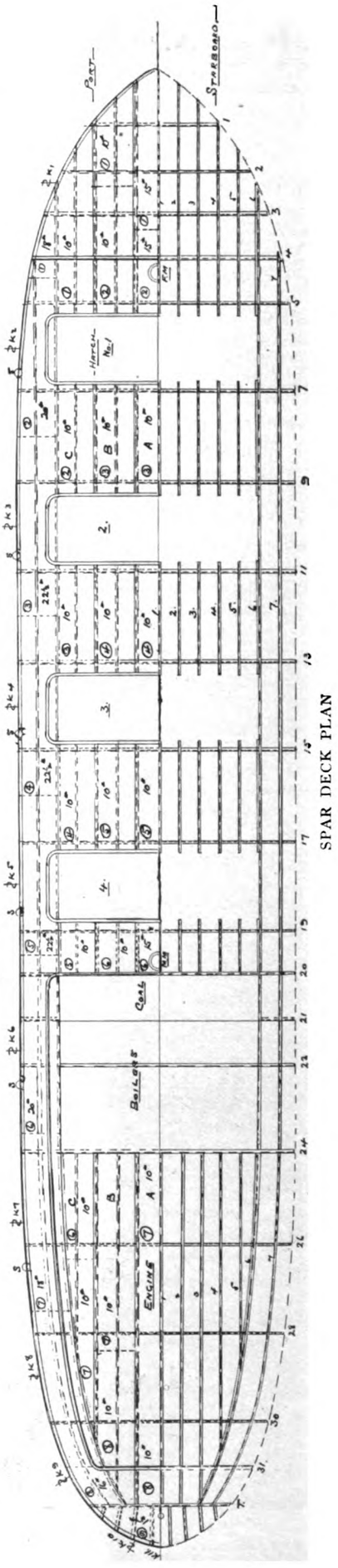
A larger volume of work for the naval gun factory at Washington and a plea that the increase in pay provided by the last congress for the mechanics at the Washington yard for the fiscal year beginning July 1 next, be placed in immediate operation were urged by a committee of the International Association of Machinists at Washington, last Friday. The committee, consisting of Thomas E. Carroll, president of the Columbia Lodge of Machinists, and chairman of the legislative committee of the National Association of Machinists; M. McGuire and E. R. Pace, called on Secretary Daniels and Assistant Secretary Roosevelt. Other matters affecting mechanics at the navy yard were discussed as assurance was given the committee that its requests would be considered.

Robert Curr, naval architect and marine surveyor, Port Arthur, Ont., has established a correspondence school for instruction in hull survey. His course is extremely helpful to masters of vessels as it enables them to secure hull surveyor's certificates and fits them for shore positions. He has been extremely busy all winter in this class of work.

The Blackmer Rotary Pump, Power & Mfg. Co., Petoskey, Mich., are putting on the market a rotary pump which is meeting with favor aboard ship as a bilge pump. It is well fitted for this work and is popular. All parts are interchangeable and an entire pump can be bought piece by piece at the price of the assembled pump.

The Hyde Windlass Co., of Bath, Me., is making the molds for the largest manganese propeller ever built in the United States. It is for a four-ton wheel 18 ft. 6 in. in diameter, and will require 30,000 lbs. of manganese bronze for the casting.

The Boston Belting Co. has removed its Chicago offices from 169 West Lake street to 172 West Randolph street.




SPAR DECK PLAN

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# Isherwood System of Construction*

## *Dealing With the Arrangement of Plates and Angles Forming the Spar Deck*

By Robert Curr

THE accompanying plan with this article, printed on page 148, shows the arrangement of plates and angles forming the spar deck.

Shown on the port side are the stringer plates, stringer angles, butts of sheer strake plating, deck plating, hatch coamings, masts, forecastle and after house foundations.

The dotted lines lengthwise are the deck longitudinals and the cross lines, the transverses.

*Starboard Side Plating*

The starboard side plating is removed which shows the transverses and longitudinals to better advantage.

The longitudinals are numbered from the center line, the angle on the center being No. 1; this longitudinal runs from the stem to the foreside of No. 1 hatch, between after end of No. 1 to the foreside of 2, afterside of 2 to foreside of 3, afterside of 3 to foreside of 4, afterside of 4 to bulkhead No. 20, and from the afterside of boiler opening to transom frame.

No. 2 longitudinal is practically the same as No. 1 with the exception of ending on the shell forward making it a little shorter. The longitudinals 1, 2, 3, 4 and 5 are the same length between transverses 7 and 20, 3, 4 and 5 are shorter at the ends. Longitudinals 6 and 7 run from 1 and 3 to the transom and are very important, which will be shown later on.

No. 6 longitudinal is double in way of the deck plating between the hatches and forms a butt strap for connecting the deck plate to the stringer plate.

The transverses Nos. 1, 3, 4, 5, 7, 9, 11, 13, 15, 17, 19, 22, 26, 28 and 31 are numbered on the starboard side. Nos. 2, 20, 21, 24 and 30 are bulkheads.

The forecastle bulkhead is fitted on transverse No. 4.

The after deck house runs between bulkhead 20 and 31, leaving 4 ft. of a passageway at the ship's side.

The outer strake of plating connected to the outside plating is the stringer plate and is made up with nine plates on each side. Plates 3, 4 and 5 are 221.2 lb. per square foot and the balance are reduced in thickness to 15 lb.

Stringer angle is 4 in. x 4 in. x 9.8 lb. and connects the sheer strake and stringer plate, making same watertight.

The stringer angle is cut clear of the scuppers and reinforced below, so that when finished represents a continuous angle all around the vessel. The scuppers are marked with a circle at S.

The sheer strake butts are marked K1 to 11 and should not be nearer the scuppers and stringer butts than 4 ft.

*Deck Plating*

There are five strakes of deck plating on the vessel. A is the center strake and outside for calking, made up with eight plates, lapped and riveted on the edges to No. 2 longitudinals, No. 1 longitudinal coming on the center of the plate. With the exception of plates Nos. 1, 2 and 6, which are 15 lb. per sq. ft., the strake is 10 lb. per sq. ft. Plate No. 1 forms the windlass foundation and Nos. 2 and 6 mast foundations.

B strake has eight plates on each side of the deck, all of which are 10 lb. per sq. ft. Both the seams of B strake are lapped on longitudinals 2 and 4 and riveted to it, the lap farthest from the center being outside or calking edge.

C strake has seven plates on each side, which are all 10 lb. per sq. ft. The inner seam is lapped on longitudinal No. 4 and under the seam of B strake and the outer edge is butted edge to edge with the stringer plate. The angle riveted to No. 6 longitudinal forming the butt strap.

Hatch coamings are composed of 9-in. and 21.8-lb. bulb angles and form a ledge for the hatch covers and keep the hatch openings watertight at the deck. Forecastle bulkhead angles are composed of 4-in. x 3-in. x 8.5-lb. angles.

The deck house aft has angles to the deck forming coamings the same as forecastle. Watertightness of the deck is very important and every effort should be made to have it so for the safety of the ship, crew and cargo depends upon it.

*This is the eighth of a series of articles on the Isherwood system of construction which began in the September issue of the Marine Review. The first article dealt with the general specifications of the steamer; the second with the sheer, half-breadth and body plans; the third explains the method of getting the sheer; the fourth dealt with the longitudinal and transverse framing; the fifth with offsets; the sixth with the shell plating and the seventh with the shell plating expansion.

## Port Arthur Ship Yard Busy

The Western Ship Building & Dry Dock Co., Port Arthur, Ont., are at present employing about 900 men. About 60 per cent of the steel work of the new passenger steamer building for the Northern Navigation Co., of Collingwood, Ont., is completed. This vessel is building under Lloyds survey. An ice tug for the Whalen interests is 85 per cent completed. This tug is heavier than the Whalen. The shell plating is ¼ in. thick and the framing is heavy and closely spaced. The floor is deep with heavy double channel keelson on top and side stringers, three on each side. The deck and houses are of steel, heavier than usual. She will have a triple-expansion engine 18, 30 and 48-in. cylinder diameter by 30-in. stroke, and a Scotch boiler 15 ft. 4 in. by 11 ft. 5 in., allowed 180 lb. steam pressure. The company is also building a smaller tug for the Whalen interests to be 85 ft. over all, 75 ft. between perpendiculars, 19 ft. beam and 11 ft. deep. The plating is 17.5 lb. per square foot and the other materials in proportion.

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Apparently package freighters are going to be in good demand, the Anchor Line having chartered the Minnetonka from the Chicago & Duluth Transportation Co. The Minnetonka was formerly the Alva of the Bradley fleet.

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As exhibiting the trend uptown even among vessel owners, M. A. Hanna & Co., Hutchinson & Co., W. C. Richardson & Co., and the Northern Lakes Steamship Co. have moved from the Perry-Payne and Rockefeller buildings to the Leader-News building, Cleveland.

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The Berwind Coal Co. will erect its fourth coal dock at West Duluth during the coming summer on property recently purchased east of the Grassy Point tracks of the Northern Pacific railroad.

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## Damage to Vessel Property

The recent floods did considerable damage to vessel property at Cleveland. The Cuyahoga river rose higher than it has been for many years past and some of the vessels broke loose from their moorings. The most notable accident was that of the steamer W. H. Mack, which drove down the stream rapidly stern first and smashed the south draw of the West Third street bridge, the draw itself later dropping into the river through its own weight and the Mack fetching up on the bottom against one of the abutments on the bridge. The steamer Andaste, of the Cleveland-Cliffs Iron Co.'s fleet, was swept upon piling at the Erie railroad docks and was extricated from the predicament with some difficulty. The Pioneer was also landed high and dry on the dock and the steamer Erwin L. Fisher was swept under the Central viaduct and transfixed on the dock there. Steps were taken at once to secure other vessels moored at the docks, extra anchors being thrown out. In a monetary sense the damage inflicted will not be heavy. The steamers J. B. Eads and W. R. Linn, of the Pittsburgh Steamship Co.'s fleet, which were tied up at the yard of the American Ship Building Co., at Lorain, broke adrift and were carried down the river to the Erie street bridge. The Eads struck the steamer J. J. Albright, of the Mitchell fleet, and damaged six or eight plates. The Presque Isle, of the Cleveland-Cliffs Iron Co.'s fleet, was also swept into a mud bank and has not as yet been extricated.

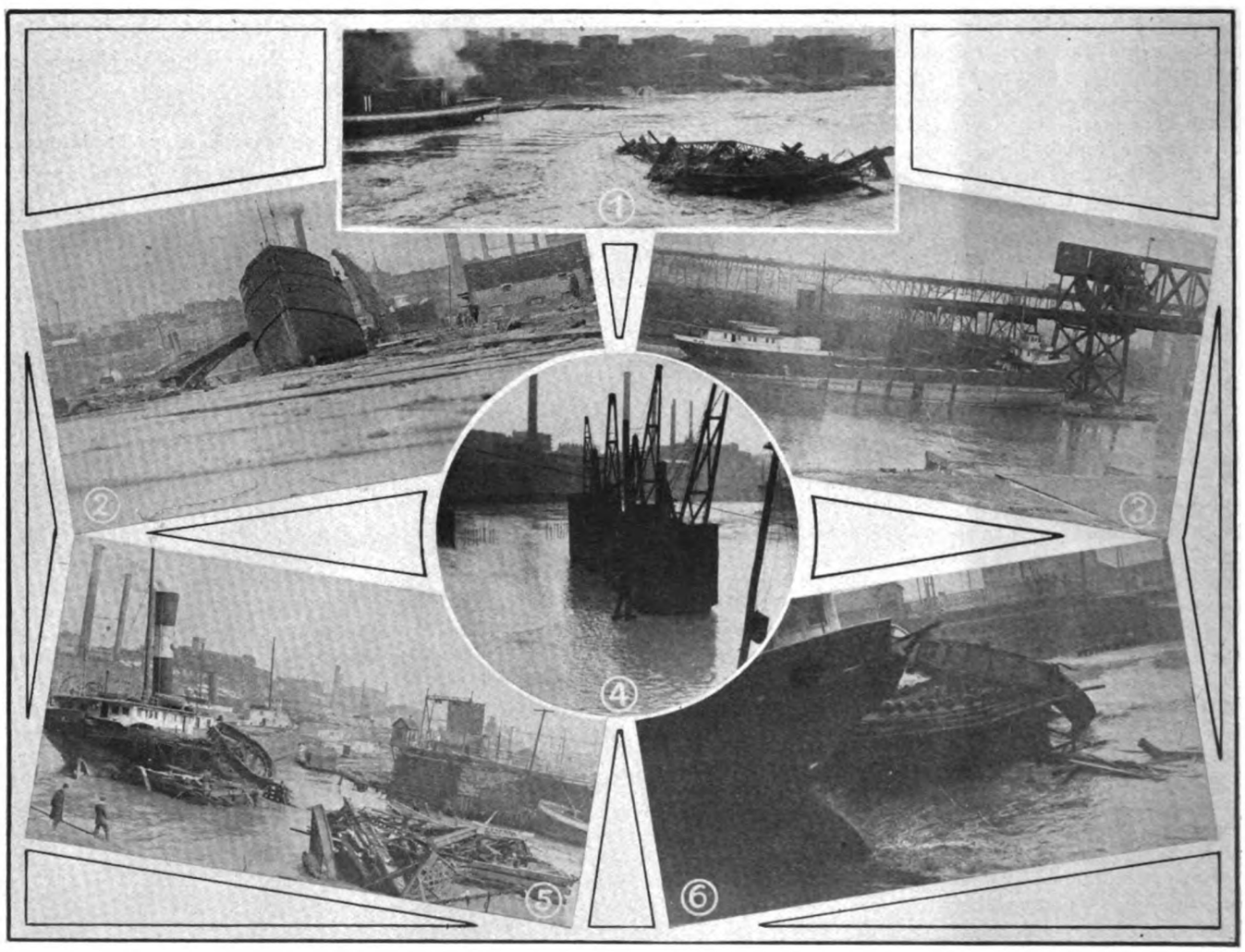

FIG. 1—THE WRECK OF THE WEST THIRD STREET DRAW. FIG. 2—THE PIONEER PERCHED ON THE DOCK. FIG. 3—THE ERWIN L. FISHER ON THE DOCK UNDER THE CENTRAL VIADUCT. FIG. 4—THE McMYLER WHIRLIES NEAR THE WEST THIRD STREET BRIDGE, PARTIALLY SUBMERGED. FIG. 5—THE WRECK OF THE WEST THIRD STREET BRIDGE. FIG. 6—THE STERN OF THE MACK AGAINST THE WEST THIRD STREET BRIDGE

## Superheating

"Superheating" is the title of a 16-page pamphlet published by the Heine Safety Boiler Co., St. Louis, Mo. The first part of the pamphlet is a reprint of a paper from the *Journal* of the Engineers Society of Pennsylvania, discussing the steam and fuel ecomomy of superheating the various designs of superheaters, the methods used for obtaining control of the temperature of superheat, and a brief description of the design and operation of the Heine superheater. The Heine superheater is installed to the side of the main boiler drum in a superheater chamber forming a part of the main boiler setting. The superheater chamber connects with the furnace by a flue through which a small percentage of the furnace gases flow. A damper at the outlet of the superheater controls the volume of gases and therefore the superheat temperature. A chart is reproduced in the pamphlet which shows the performance of a Heine superheater, illustrating how the steam temperature is maintained within about 5 degrees of the mean. The last part of the pamphlet is devoted to abstracts from the *Transactions* of the American Society of Mechanical Engineers.

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# U. S. G. Co.'s Mexican Boiler Graphite

*Its action is gently mechanical—not chemically severe and it cuts the cost of Boiler cleaning one-half.*

## *How it Works—*

Owing to the unequal expansion and contraction of the metal of a boiler and the scale in it, the latter, during alternate periods of heating and cooling, becomes more or less cracked and checked.

It is this condition—the presence of these little cracks and checks—that gives to U S G CO'S MEXICAN BOILER GRAPHITE its power to disintegrate and break down old scale, regardless of character and thickness. It does this, too, in a manner that is GENTLY MECHANICAL—not, like "compounds", chemically severe and correspondingly hard on the boiler itself. While circulating with the water U S G CO'S MEXICAN BOILER GRAPHITE works into these minute cracks and checks (which otherwise are almost immediately re-cemented by the scale-forming matter carried by the feed water), and deposits itself on to the inner surfaces of tubes and shell, with the result that the scale will no longer adhere tenaciously and may be removed with comparative ease.

Then, after a boiler has been cleaned of its accumulation of old scale, the continuous use of this Boiler Graphite in the correct quantity and manner will prevent the subsequent formation of that hard scale so difficult to remove, for it forms in and with the scale matter, and keeps same in such loose condition as to permit of its being easily taken out.

## "After trying some five or six boiler compounds, both in liquid and dry state, with very poor results, we decided to give your Mexican Boiler Graphite a trial, and secured results far better than we expected—and we have used same exclusively for the past two years."

(The above from a well-known Kansas City manufacturer. Copy of complete letter will be furnished to interested parties upon request. We have thousands of others in our files, similar in tenor to the above.)

What U S G CO'S MEXICAN BOILER GRAPHITE has done for others, it will do for you—it has "MADE GOOD" our every claim, in thousands of power plants throughout this country, Canada and Mexico, and is endorsed by them as the surest, safest, most reliable and least expensive of all scale remedies.

Acting MECHANICALLY, not chemically, U S G CO'S MEXICAN BOILER GRAPHITE is effective in any feed water, regardless of its character, and for the same reason, has no destructive effect, chemical or otherwise, on the boiler itself, neither can it be the cause of foaming, nor under normal conditions will it carry out with the steam.

All this—and more, has been proven beyond the question of a doubt in thousands of exhaustive tests conducted under the most trying conditions.

U S G CO'S MEXICAN BOILER GRAPHITE will "stand-up" under the closest investigation, it has proven its merit in actual service, and today is universally known as the one Scale Remedy that lives up to its record and its reputation, day in and day out—always the same.

Put up in 100 pound drums and barrels (about 400 pounds)—quotations on request. Clip the coupon. Get our latest booklet. Ask for testimonials. Learn more about MEXICAN BOILER GRAPHITE.

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# Big Lake Vessel Merger

***Details of the Plan Whereby the Lackawanna Steamship Co. Will Acquire Seventeen Steamers of the Gilchrist Fleet as Well as Other Fleets***

ARRANGEMENTS are now being made whereby the 17 steel steamers belonging to the fleet of the Gilchrist Transportation Co., Cleveland, which were purchased by the Guardian Savings & Trust Co. on behalf of the creditors, will be acquired by the Lackawanna Steamship Co., of that city, together with a number of other fleets, making the Lackawanna Co. one of the strongest from the vessel standpoint on the lakes. The name of the Lackawanna Steamship Co. will be changed to the Interlake Steamship Co. in order to give it a more comprehensive title. The Guardian Savings & Trust Co. has agreed to deliver the steamers to the new company at actual cost, which, as known, was approximately two-thirds of the appraised value. The other steamers which it is contemplated to purchase are the fleets of the Standard Steamship Co., the Acme Steamship Co., the Mesaba Steamship Co., the Provident Steamship Co., the Huron Barge Co. and the Interlake Co. The steamers embraced in the consolidation are as follows:

GILCHRIST TRANSPORTATION CO. FLEET.

| Name of vessel | Capacity, gross tons |
|---|---|
| F. W. Gilchrist | 7,000 |
| J. L. Weeks | 7,000 |
| P. G. Walker | 7,000 |
| J. C. Gilchrist | 7,000 |
| R. E. Schuck | 7,000 |
| R. L. Ireland | 7,000 |
| H. S. Sill | 7,000 |
| L. Woodruff | 7,000 |
| F. J. Hecker | 8,100 |
| George H. Russel | 8,100 |
| J. B. Wood | 9,800 |
| John Sherwin | 9,800 |
| Gilchrist | 6,000 |
| Lake Shore | 6,000 |
| Jupiter | 5,300 |
| Venus | 5,300 |
| Neptune | 5,300 |
| ACME STEAMSHIP CO. | |
| Ward Ames | 10,000 |
| J. C. Wallace | 10,000 |
| A. B. Wolvin | 10,000 |
| STANDARD STEAMSHIP CO. | |
| H. P. Bope | 10,000 |
| MESABA STEAMSHIP CO. | |
| Amasa Stone | 9,600 |
| Samuel Mather | 10,000 |
| J. C. Morse | 10,000 |
| D. O. Mills | 10,000 |
| LACKAWANNA STEAMSHIP CO. | |
| Corona | 3,120 |
| Crete | 8,500 |
| Elba | 7,500 |
| Odanah | 7,500 |
| Hemlock | 7,500 |
| Calumet | 7,500 |
| Adriatic | 7,500 |
| PROVIDENT STEAMSHIP CO. | |
| James H. Hoyt | 6,700 |
| D. G. Kerr | 7,800 |
| J. H. Reed | 7,800 |
| HURON BARGE CO. | |
| Pathfinder | 4,100 |
| Sagamore | 5,800 |
| INTERLAKE CO. | |
| Victory | 7,000 |
| Constitution | 7,000 |

The purpose of the Lackawanna Steamship Co. in desiring to add a number of vessels to the Gilchrist fleet is that they may have sufficient to warrant carrying their own insurance. Experience has shown that with a fleet as large as 39 vessels, the owning company can profitably carry its own insurance.

It is proposed to issue $3,000,000 par value 6 per cent gold bonds to retire outstanding bonds and to provide an insurance fund. These bonds will be a lien upon the entire fleet and the mortgage securing them will contain a self-insurance clause which permits the carrying of insurance by the company itself upon the initial payment of $250,000 to the trustee under the mortgage and annual payments thereafter equal to the premiums that would naturally be paid if the fleet were insured. From this fund all losses will be paid, new vessels purchased and bonds retired. In addition the company will have a capital stock of $6,500,000.

The general plan has already been approved by the majority of the stockholders of the Lackawanna Steamship Co., and a meeting of the stockholders is to be held on April 25 to close the deal. The valuation of the various vessels was determined upon by Robert Logan and A. G. Smith, marine architects. With these valuations as a basis, the earnings of the several vessels during the year 1912 have been taken as a means of arriving at their respective values, as shown above.

Using the valuations stated in the last column, that is to say, the average of appraisers' and earnings valuations, and deducting therefrom the outstanding bonds and notes to be borne by the selling companies, the amount payable to each in the full-paid capital stock of the Interlake Steamship Co., follows: Mesaba, $1,332,133.66; Lackawanna, $1,339,587.79; Interlake, $299,241.64; Huron Barge, $203,610.31; Provident, $468,469.87; Acme, $761,169.39; and Standard, $181,467.34.

VALUATIONS AND EARNINGS OF COMPANIES

| Company. | Vessels. | Appraisers' valuations. | 1912 earnings. | Earnings per cent. | Earnings valuations. | Average of appraisers' and earnings valuations. |
|---|---|---|---|---|---|---|
| The Mesabi Steamship Co. | 4 | $1,407,980 | $194,404.40 | 30.135 | $1,784,287.32 | $1,596,133.66 |
| The Lackawanna Steamship Co. | 7 | 1,944,730 | 191,157.21 | 29.631 | 1,754,445.58 | 1,849,587.79 |
| The Interlake Co. | 2 | 353,000 | 31,643.29 | 4.906 | 290,483.28 | 321,741.64 |
| The Huron Barge Co. | 2 | 220,000 | 27,260.21 | 4.226 | 250,220.62 | 235,110.31 |
| Provident Steamship Co. | 3 | 663,000 | 67,760.75 | 10.504 | 621,939.74 | 642,469.87 |
| Acme Steamship Co. | 3 | 996,660 | 106,629.08 | 16.529 | 978,678.78 | 987,669.39 |
| Standard Steamship Co. | 1 | 335,610 | 26,253.95 | 4.069 | 240,924.68 | 288,267.34 |
| | 22 | $5,920,980 | $645,108.89 | 100.000 | $5,920,980.00 | $5,920,980.00 |

## Steamer Lorenzo Delivered

The fourth ship, Lorenzo, built by the Newport News Shipbuilding & Dry Dock Co. for The New York & Porto Rico Steamship Co. and designed by Theodore E. Ferris, has been delivered to her owners. She is a sister ship and exact duplicate of three preceding ships built for The New York & Porto Rico Steamship Co., namely, Corozal, Montoso, and Isabella. The Lorenzo, like her sister ships, will engage in the freight business between New York and Porto Rico and is of the following dimensions: Length over all, 347 ft., length between perpendiculars, 334 ft., beam 46 ft. 9 in., depth 25 ft.

The propelling machinery consists of triple-expansion engine and three Scotch boilers. The ship has sustained speed of 10 knots.

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The Southern Transportation Co., with an authorized capital of $500,000, has been incorporated at New Orleans with the following officers: C. A. Barbour, president; L. A. Jung, vice president; C. K. Burns, secretary and Traver Holland, treasurer. It is believed that the Texas Oil Co. is associated with the new company.

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The Southern Steamship Co. has purchased the steamers Ossabow, Ogeechee, Ocumumlgee, Satilla and Steamship Co., which is an ally of the Alta Maha from the Texas City Clyde Steamship Co. They will be operated between Philadelphia and Texas ports.

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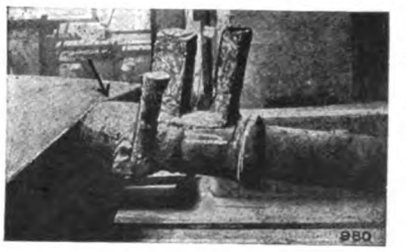

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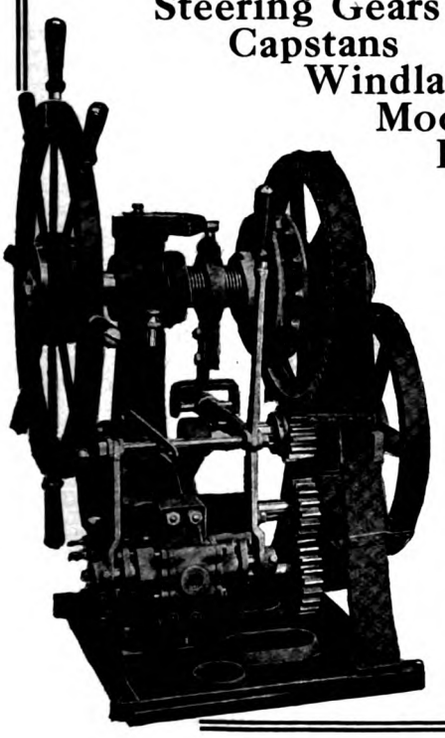

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## Obituary

**Aaron Vanderbilt,** who has been called the "Father of the Naval Reserve", died at his home in Remsenburg, L. I., on Wednesday, March 27. His unceasing and unselfish efforts to create on the sea an adequate naval reserve similar to that which supplements the army on land met with approbation some years ago by congress when the title of honorary commander of the United States naval reserve was conferred upon him by congress. Mr. Vanderbilt's whole life was devoted to the upbuilding of the merchant marine interests of the country and he was instrumental in the formation of an industrial and shipping in the foreign trade, began was elected vice president of the Merchant Marine League of the United States which was organized in Cleveland in November, 1904. When the Merchant Marine Commission, which was appointed by congress to inquire into the state of American shipping in the foreign trade, began its tour in 1904, its very first communication was submitted to Mr. Vanderbilt, who was at that time the chairman of the merchant marine committee of the New York board of trade and transportation.

Mr. Vanderbilt was descended from a family that has borne a distinguished part in the maritime history of the country. He was born in Tompkinsville, Staten Island, Jan. 29, 1844, and received his early education at the public and private schools of New York and Brooklyn. In his fifteenth year he entered the maritime business in New York as a clerk. While engaged in the merchant marine service he made several voyages abroad and acquired a practical knowledge of navigation. Mr. Vanderbilt was in the south of France when Lincoln called for volunteers and he immediately sailed for home, reaching New York just after the battle of Bull Run and serving with distinction throughout the war.

At the end of the civil war, Mr. Vanderbilt again entered maritime business in New York. He established a line of packets running from New York to Florida and was also associated with the operation of vessels to the Mediterranean, later assuming the position of general superintendent of the New York & Cuba Mail Line.

A cause which lay very close to Mr. Vanderbilt's heart was the establishment of a naval reserve to supplement the navy in the same manner that the militia of the various states supplements the regular army. As chairman of the naval reserve committee of the board of trade and transportation, Mr. Vanderbilt took up the subject with Hon. William C. Whitney, who was secretary of the navy at that time, and projected a most energetic campaign throughout the country in favor of it. His point was that it would protect the sea in times of war with a disciplined nucleus which would act as an advance guard on duty while the volunteers were being prepared for war.

In later life Mr. Vanderbilt engaged in the manufacture of machinery, being vice president of the Wheeler Condenser & Engineering Co. of New York. He was a member of the Army and Navy Club, of Washington, the Naval Order of the United States, the Military Order of the Loyal Legion, the G. A. R., the Society of the Naval Institute of Annapolis and a director of the Navy League.

He leaves two daughters, Mrs. Louis Dean Spier and Mrs. W. C. Diamond.

**William H. Fletcher,** vice president of the W. & A. Fletcher Co., North River Iron Works, Hoboken and president of the Consolidated Iron Works, Hoboken, died at his home in New York City, April 2, in his 56th year, after a brief illness. Mr. Fletcher was a well known engineer and shipbuilder. The firm of which he was vice president built many important steamships, steamboats and steam yachts in this country. Many of the craft in service on the Hudson and in the New England steamship lines, among them the new Washington Irving, was built in the yards of his company. Among the private yachts constructed by the firm were the Corsair of the late J. P. Morgan, the Intrepid of Lloyd Phoenix, the Isis of Spaulding Bros., Boston, and the Sovereign for M. C. D. Borden, now the Scorpion in the United States navy. Mr. Fletcher was a leading member of the Engineers' Club, New York City. He served as its president for several terms and was largely instrumental in having the present building erected. For many years he was vice president of the Webb's Academy and Home for Shipbuilders. He was secretary of the Robert Fulton Memorial Association and a member of the American Society of Naval Architects and Marine Engineers, the American Society of Mechanical Engineers and the New York Yacht Club.

**George William Quintard,** president and founder of the Quintard Iron Works Co., 742 East Twelfth street, New York City, died April 2, at his home in New York City. He was 91 years of age. He was a very active personality, retiring only eight years ago from active management of the works.

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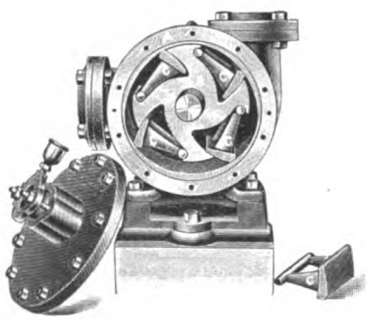

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